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Economic Impact of Marine Activities in Large Ocean Management Areas

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Economic Impact of Marine Activities in Large Ocean Management Areas

Gardner Pinfold

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SUMMARY

Overview

The Government of Canada has established five Large Ocean Management Areas (LOMAs) in order to advance collaborative management. The goal is sustainable management of resources within LOMA boundaries, with the participation of all levels of government, Aboriginal groups, industry organizations, environmental and community groups and academia. This goal will be achieved through integrated ocean management – an approach based on addressing socio-economic needs of those directly and indirectly dependent on the ocean, while preserving the health of the marine ecosystem.

There are three LOMAs on the east coast, one in the western Arctic and one on the west coast:

- Placentia Bay/Grand Banks (PG/BG)
- Eastern Scotian Shelf (ESSIM)
- Gulf of St. Lawrence (GOSLIM)
- Beaufort Sea (Beaufort)
- Pacific North Coast (PNCIMA)

Human activities in each LOMA generate substantial economic wealth. The range of activities typically includes exploitation of living and non-living marine resources such as fisheries and oil & gas, non-consumptive uses such as shipping and tourism, as well as security and management including the work of maritime defence and scientific research.

Having a clear understanding of the economic and social value of the marine environment is essential to the development of sound policy and programs aimed at sustainable management. The estimates of economic value set out in the table below provide a sense of what is at stake, thereby providing an impetus to plan and implement management initiatives.

Impacts

Placentia Bay/Grand Banks – all marine activities occur to a greater or lesser extent within the area, though the economic impact is dominated by offshore oil & gas, which accounts for 90% of the contribution to GDP in the LOMA. The fishing industry, marine transportation and offshore oil & gas combined (more or less in equal parts) account for most of the employment and income. Marine activity in PB/GB generates about $9.6 billion in GDP and creates just over 26,000 jobs (Table S.1).

Eastern Scotian Shelf – activity on the Scotian Shelf is dominated by offshore oil & gas, which accounts for over half the total contribution to GDP in the Area. Marine transportation, national defence and tourism also make significant contributions (ESSIM includes the Port of Halifax), while fishing accounts for a relatively small proportion of overall activity. Marine activity in ESSIM generates about $2.4 billion in GDP and creates about 29,000 jobs (Table S.1).

Gulf of St. Lawrence – the seafood sector dominates marine activities in the Gulf LOMA, with marine transportation, tourism and shipbuilding/boatbuilding also making significant contributions. Marine activity in GOSLIM generates about $2.7 billion in GDP and creates over 52,300 jobs (Table S.1) in the five adjacent provinces.

Pacific North Coast – marine transportation (cargo and ferries), the seafood sector and tourism dominate marine activities in the area. Marine activity in PNCIMA generates about $1.4 billion in GDP and creates just under 20,000 jobs (Table S.1).

Beaufort – low levels of marine activity and limited data make economic impacts difficult to estimate. Activity and impacts would increase substantially if proposed offshore oil & gas developments go ahead.

Table S.1: Economic impact of marine activities in LOMAs

	PB/GB	ESSIM	GOSLIM	PNCIMA
GDP ($000s)				
Direct	7,704,330	1,713,802	1,422,871	723,164
Indirect	1,252,618	350,961	684,151	318,262
Induced	634,855	339,943	553,732	334,059
Total	**9,591,803**	**2,404,705**	**2,660,754**	**1,375,485**
Employment (FTE)				
Direct	15,301	16,646	28,790	11,128
Indirect	6,513	6,682	12,390	4,152
Induced	4,334	5,730	11,125	4,379
Total	**26,147**	**29,058**	**52,305**	**19,658**
Income ($000s)				
Direct	754,241	758,690	1,105,102	537,877
Indirect	222,976	242,499	433,213	162,531
Induced	205,421	275,079	449,000	231,851
Total	**1,182,639**	**1,276,267**	**1,987,315**	**932,259**

Impacts derived from Statistics Canada Inter-provincial Input-Output Model, 2005
See Tables 3.16, 4.15, 5.14 and 7.14 for details.
Note: insufficient data are available to estimate Beaufort impacts.

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I

INTRODUCTION

1. Rationale

The Government of Canada has established five Large Ocean Management Areas (LOMAs) in order to advance collaborative management. The goal is sustainable management of resources within LOMA boundaries, with the participation of all levels of government, Aboriginal groups, industry organizations, environmental and community groups and academia. This goal will be achieved through integrated ocean management – an approach based on addressing socio-economic needs of those directly and indirectly dependent on the ocean, while preserving the health of the marine ecosystem.

Human activities in each LOMA generate substantial economic wealth. The range of activities typically includes exploitation of living and non-living marine resources such as fisheries and oil & gas, non-consumptive uses such as shipping and tourism, as well as security and management including the work of maritime defence and scientific research.

Having a clear understanding of the economic and social value of the marine environment is essential to the development of sound policy and programs aimed at sustainable management. An estimate of economic value provides a sense of what is at stake, thereby providing an impetus to planning and implementing management initiatives.

To this end, this report contains an overview of the nature and magnitude of the human activities in each LOMA, with an estimate of the economic impact of these activities. It explores the types of human uses, providing a sense of the scale of each activity using industry-specific indicators.

2. Scope

Five LOMAs on Canada's three coasts have been created under the *Oceans Act*. Each covers an area of at least several hundred thousand km^2, with the boundaries determined using a combination of ecological and administrative considerations. Maps of each are provided in the discussion of LOMA activities, following. There are three on the east coast, one in the western Arctic and one on the west coast:

- Placentia Bay/Grand Banks (PG/BG)
- Eastern Scotian Shelf (ESSIM)
- Gulf of St. Lawrence (GOSLIM)
- Beaufort Sea (Beaufort)
- Pacific North Coast (PNCIMA)

The analysis attempts to quantify the economic value of human activities in the marine economy in each LOMA. The marine economy captures those activities – individual, industry and administrative – that are primarily dependent on or related to the ocean. These include fishing and fish processing, offshore oil & gas production, shipping, defence and public administration by federal and provincial departments. The analysis covers the years 2002-2006, with annual activity data provided where possible. Economic impact is estimated for 2006.

3. Contents

Following this Introduction, Chapter II sets out the methodology used to generate the economic impacts. Methodology includes a section identifying and defining the specific activities comprising the marine economy, and explains the distinction between primary and secondary activities. Data requirements and sources are identified, and any limitations specified. The methodology goes on to explain the approach used to measure the economic value of the specified marine activities, including the meaning of specific indicators and how direct, indirect and induced impacts are defined.

Chapters III to VII explain the nature and scope of marine activities in each of the LOMAs. Each section contains an overview of the main human activities and their economic significance using industry-specific indicators. The linkages between these activities and the broader economy are identified. Significant economic interactions amongst activities and how these are addressed are summarized. Finally, an estimate of the economic impact of LOMA activities is provided, with a brief outlook on factors likely to affect impacts in the future. The basis for allocating provincial marine activity impacts to LOMAs is explained in the Appendices.

4. A companion report

This report builds on the results contained in a related study, *The Economic Impact of Marine Related Activities in Canada* (2009), prepared by Gardner Pinfold for Fisheries and Oceans Canada. That study contains estimates of the output value of marine activities (national and regional basis) and the impacts flowing from those activities. It is those values and impacts that form the basis of the LOMA impacts contained in this report. The reader interested in knowing more about the derivation of output values for each activity and how they affect regional and national economies in Canada should consult *The Economic Impact of Marine Related Activities in Canada* (2009).

II

METHODOLOGY

1. The ocean economy

This study is concerned with estimating the economic impact of ocean activities. More specifically, it is concerned with the economic impact of ocean activities occurring within the boundaries of each of the five LOMAs.

The marine economy includes those individual, industrial and administrative activities dependent on or related to the ocean. This is neither a precise nor a technical definition, but one that serves as a practical guide for identification of relevant marine activities. To ensure consistency with statistical databases, the North American Industrial Classification System (NAICS) is used to categorize industries. The list includes direct and indirect activities in the private and public sectors that are identified as either primary or secondary according to the state of knowledge about the activity (Table 2.1):

- **Primary marine activities** – these represent the core of the marine economy; industries deriving their economic rationale in a direct way from their extractive or non-extractive use of marine resources. Such activities include fishing, offshore oil & gas, ship and boat building and repair, water transportation, and marine construction. It also includes federal and provincial departments and agencies with management and administrative responsibilities over ocean uses.
- **Secondary marine activities** – these may be industries in their own right or form part of a broader industry grouping. Though their contribution to the economy may be picked up as indirect impacts by an economic model, they are singled out for attention in this study in order to shed more light on the nature and scope of the activity and the linkages with other sectors of the economy.

  The original intention was to conduct an analysis of the potential economic value of six of the secondary activities identified with an "X" in Table 2.1. As it turned out, three of the activities could be included in the full economic impact analysis as though they were primary activities. This is the case with Support Services for Oil and Gas Extraction (NAICS 213), coastal tourism and recreation (NAICS 4872) and Environmental Non-Governmental Organizations (ENGOs). This level of analysis became possible because sufficient data were obtained or developed to allow the impact methodology to be applied.

  A full economic impact analysis could not be carried out for the other three activities: subsistence fishing, refining and pipeline transportation. This is mainly because of data limitations. Nonetheless, each is described, with a discussion of possible analytical approaches, data requirements and challenges.

Table 2.1: Relevant marine sectors for economic impact analysis

			Focus of Analysis	
			Primary	Secondary
Private	**NAICS #**	**Industry**		
Seafood				
	114	Fishing	X	
	1125	Aquaculture	X	
	3117	Processing	X	
		Subsistence fishing		X
Offshore Oil & Gas				
	211	Exploration-Extraction	X	
	213	Support services		X
	32411	Refineries		X
	486	Pipeline transportation		X
Marine Transportation				
	4831	Freight & passenger transportation	X	
	4883	Support services for marine transportation	X	
Ocean-Based Recreation/Leisure				
		Recreational fishing	X	
	4831	Cruise Ship Travel	X	
	4872	Coastal tourism/recreation		X
Marine Construction				
	23712	Oil & Gas facilities installation	X	
	23799	Ports, harbours & marine works	X	
		Other (cable, renewable energy, etc)		
Manufacturing				
	33451	Navigation & guidance equipment	X	
	3366	Ship & boat building	X	
		High tech Manufacturing		
Services				
	5416	Professional Services/Env Consulting		
		High Tech Services		
Public		**Department**		
Federal Government				
		Fisheries and Oceans	X	
		National Defence	X	
		Transport Canada	X	
		Environment Canada	X	
		Parks Canada	X	
		Natural Sciences & Engineering Research Council	X	
		Indian and Northern Affairs	X	
		Natural Resources Canada	X	
		Canadian Food Inspection Agency	X	
Provincial/Territorial Government				
		Fisheries & Aquaculture	X	
		Transport/Ferries	X	
		Energy	X	
Universities and research			X	
ENGOs				X

2. Measuring impacts

Reporting on marine activities begins with a descriptive profile of each, setting out its nature and economic characteristics and providing an overview of its linkages with other marine sectors and the economy more generally. Key factors affecting activity performance and trends are discussed and quantified using industry-specific indicators. Relevant factors include resource conditions and markets, with performance measured using such indicators as production, number of establishments, employment and exports.

Economic impact is measured with three indicators:

- **GDP** – an industry's contribution to Gross Domestic Product represents its broadest measure of economic impact. The domestic product of an industry captures the value it adds to purchased inputs through the application of labour and capital. GDP represents the sum of the value added by each industry. Value added should not be confused with sales value, since the latter would include the value of purchased inputs.
- **Labour income** – this captures the payments to labour in the form of wages and salaries earned in the marine industries. Returns to labour in the form of wages and salaries form a key component of GDP. Industries paying relatively high average wages and salaries generate a correspondingly higher economic impact than industries paying lower average incomes.
- **Employment** – industry employment is important politically because of the significance generally attached to jobs, but from an economic impact perspective, the significance lies in the economic impact generated through the spending of employment income. The greater the employment and higher the average income, the more significant the industry in terms of economic impact.

Economic impacts are generated through direct, indirect and induced demand in the economy expressed in terms of industry and consumer purchases of goods and services.

- **Direct impact** – refers to impact arising from the expenditures made by firms in the subject industries on the goods and services needed to produce industry outputs. For example, the fishing industry buys nets and traps from manufacturers; water transportation buys pilot services from the Pilotage Authorities; the oil & gas industry buys logistical support services from supply vessel companies.
- **Indirect impact** – refers to the inter-industry purchases triggered by the direct demand. For example, net makers buy monofilament line from manufacturers; pilot boats buy fuel from suppliers; supply vessel companies buy vessel maintenance. These industries in turn buy more basic goods and services, and so on.
- **Induced demand** – refers to the demand created in the broader economy through consumer spending of incomes earned by those employed in direct and indirect activities. It may take a year or more for these rounds of consumer spending to work their way through an economy.

The sum of impacts flowing from each level of demand gives the overall economic impact of Canada's marine sectors. Generally, the greater the domestic supply capability at each level, the greater will be the economic impact. Conversely, the higher the import content, the weaker the domestic industry response (multipliers) and the lower the impact.

Quantifying economic impacts, then, begins with comprehensive data on the gross value of output for each of the marine activities selected for analysis. For private sector activities, gross value of output means revenues generated through sales; for public sector activities, gross value of output corresponds to total expenditures. As the expenditures needed to produce the output work their way through the economy, they generate the GDP, employment and labour income the study aims to quantify.

Economists rely on economic models to quantify impacts at a national, regional or provincial level. Models provide a simplified view of the economy, expressing the myriad demand and supply transactions in the productive process as a set of coefficients or quantitative relationships. These coefficients are based on empirical measurement of flows in the real economy.

This study uses an input-output model, specifically, the Statistics Canada Inter-provincial Input-Output Model (2004 version) to generate the economic impacts. The use of an input-output (I-O) model is considered most appropriate for this study because:

- An I-O model is capable of producing the desired outputs – the direct, indirect and induced impacts, provided it has "open" and "closed" versions. Running the open version allows labour income to "leak" out of the economy, with impacts confined to indirect effects. Running the closed version forces labour income to flow through the economy, resulting in an aggregate measure of indirect and induced impacts. The difference between the two runs represents the measure of induced impact. To determine induced impacts, Statistics Canada applies what it refers to as a partial closure of the model. This essentially captures first-round induced spending impacts, resulting in a conservative impact estimate.
- The I-O model is a matrix capturing inter-industry flows of purchases and sales, thus allowing impacts to be measured and reported at the highest resolution. General equilibrium and economic base models are structured at an aggregate economic level, lacking the sensitivity to accept industry-specific "shocks" and unable to produce industry-specific results.

To run the I-O model, Statistics Canada would raise industry expenditures by an arbitrary amount – typically $10 million – thus triggering the inter-industry flows of purchases and sales resulting in direct and indirect impacts. The impacts would be grossed up according to the ratio of the actual value of industry output (final demand) to the arbitrary $10 million shock. Clearly, for this kind of analysis it is critical to have value of output data at the industry level.

Two disadvantages of using an I-O model are commonly cited: linearity of results and static inter-industry coefficients.

- Linearity of results implies that the economy does not encounter production constraints or inflation since the model will produce constant results according to the fixed coefficients embedded in it. This is a valid concern, though not one that affects this study given its scope and objectives (the study is not trying to measure the impact of a major change in expenditures that would be inconsistent with inter-industry relationships embodied in the I-O model).
- Static coefficients imply lack of technological innovation and no shifts in spending as a result of global competition. This is a valid concern if the model is not up-dated regularly. But given how slowly structural change occurs in an economy, as long as the model relies on industry data no more than 3-4 years old, such dynamic effects would be reflected in the coefficients. The Statistics Canada Inter-provincial Input-Output Model meets this test since just one year separates the model version (2005) from the impact year (2006).

Deriving the impacts for each LOMA involves several steps. It begins with a bottom-up approach to compile industry-specific data at the provincial level for each of the marine activities. If the LOMA forms just part of a province's or territory's coastal waters, the data are allocated to the LOMA based on factors derived from the share of each activity that is estimated to occur there. This approach is used for ESSIM, PG/BG and PNCIMA. If the LOMA combines the coastal waters of more than one province or territory, these data are combined to create factors based on the provincial or territorial share of each activity occurring within the LOMA boundary. This is the approach used for GOSLIM and Beaufort.

The economic impacts for each LOMA are estimated using a top-down approach. This is necessitated by the structure of the I-O model. The model is run for each industry at the provincial level. This gives impacts for each industry by province. By applying the allocation factors outlined above, the impacts for each LOMA can then be derived.

3. Data and data sources

The study requires data for two main reasons: to describe marine activities in sufficient detail to allow the reader to develop a clear understanding of the nature of the activity and the extent of its economic significance; and, to drive the I-O model in order to generate reliable economic impact estimates. To these ends, the data compiled in the course of the study meet four key criteria:

- **Consistency** – data allow for comparability across industries and locations, and reflect standard economic theory describing measures of economic activity. This means the same data, methods and tools are used for each industry and in each province or area where impacts are measured. Most of the data originate with Statistics Canada or are consistent with Statistics Canada definitions. Key exceptions are commercial and recreational fisheries data, originating with Fisheries and Oceans Canada Canada; cruise ship tourism data obtained from special studies; public administration, university and ENGO data obtained directly from relevant departments, agencies, universities and environmental organizations in the course of this study.
- **Comparability** – data are consistent over time so that changes can be observed and measured. Failure in this respect results in uncertainty about whether what is observed is due to real change or merely to definitional differences. This means using standard classifications for industries under consideration. The North American Industrial Classification System (NAICS) is used for this study.
- **Accuracy** – while each marine activity represents a distinct industry for which direct, indirect and induced impacts can be measured, adjustments have to be made to eliminate double counting when calculating *total* impacts for certain indicators (e.g., employment). The potential for double counting is great in assessing ocean impacts because of the interdependence of many activities. For example, the output from primary fishing forms a key input for fish processing, i.e., fishing represents an *indirect* activity of fish processing. Similarly, navigational services are an indirect activity for marine shipping. Failure to make adjustments in data or results would lead to an overstatement of overall impacts.
- **Replicability** – data and methods should be one that others can repeat so that the analysis can be carried out periodically allowing time series measures of the ocean economy. This means that data, methods and models used should be readily accessible for future analyses. For this reason, data definitions, sources and methods used to derive data, are carefully explained in the text and tables, and any assumptions made explicit.

4. Interactions

The report includes a high level, qualitative overview of interactions amongst the various activities. The discussion is intended to inform the reader in a general way about the interdependence of marine activities, with the nature and extent of the interactions based on background documents and the consultant's knowledge of the activities in each LOMA.

The focus is on economic interactions (highlighting the interdependence between and among activities), though interactions may also be physical and biological. The economic interactions could either be competitive, where two or more activities compete for resources or markets (e.g., competition for labour by fishing and oil & gas), or complementary, where two or more activities are linked through their inputs and outputs (e.g., fishing and processing). The physical interactions occur primarily when there is competition for marine space (e.g., aquaculture and fishing). Biological interactions occur when one activity generates side effects affecting the ability of others to carry on their activities, or affecting the quality or quantity of others' production (e.g., oil spills and fishing).

5. Limitations

The results fairly represent the nature and extent of marine activities in each of the LOMAs and the magnitude of the economic impacts. Social, Economic and Cultural Overview Assessment (SECOA) reports prepared by Fisheries and Oceans Canada form the basis of the LOMA activity descriptions. Nonetheless, the reader is cautioned that due to the lack of LOMA-specific economic data for some industries, the levels of marine activity and the resulting economic impacts within each LOMA represent estimates that should be considered indicative rather than definitive.

Among the specific data strengths and weaknesses having a bearing on the accuracy of the results:

- **Fishing** – catch data by statistical area obtained from Fisheries and Oceans Canada Canada quota reports are used as the basis for determining the level and scope of fishing activity in the LOMAs (and augmented by the SECOA reports). This source allows the share of total catch accounted for by the LOMA to be calculated, providing the basis for determining the allocation factor to distribute/combine provincial impacts.
- **Aquaculture** – production levels by species within a LOMA are not available so they are estimated by first calculating average production by site by species for the province and then applying this average to the number of sites located in the LOMA. This necessarily results in an approximation because LOMA sites may exceed or fall short of provincial averages. Proportion of production is used as the factor to allocate provincial economic impacts.
- **Fish processing** – data on the number of plants and approximate employment levels within each LOMA are obtained from provincial sources. Production levels attributable to the LOMA are estimated on the basis of the LOMA share of the catch by species. This is an approximation because extensive trucking of fish means landings from the LOMA may be processed elsewhere, and plants within the LOMA may process fish landed outside it. The share of total provincial processing sector production is used as the factor to allocate provincial economic impacts.

- **Offshore oil & gas** – data on activity, provincial expenditures and production levels are obtained from regulatory agencies (federal-provincial boards in Newfoundland and Labrador and Nova Scotia). These are used to run the I-O model. Since all offshore oil & gas activity occurs within LOMA boundaries (PB/GB and ESSIM), allocation of impacts is not an issue.
- **Support services for oil & gas** – good descriptive information is available for this activity, though because these services do not constitute an industry in their own right, quantitative information tends to be poor. Economic impacts can be estimated for this activity because it has a distinct commodity code in the I-O model. Consistent with oil & gas activity, all support service impacts are assumed to occur within the LOMA.
- **Marine transportation** – data on shipping activity (vessel traffic, cargo tonnage, ferry passenger loads) is available from Statistics Canada at the port level. Though this would allow any provincial economic data on shipping to be allocated to the LOMA, limited economic data are available due to confidentiality. Nonetheless, there are sufficient data to run the I-O model, and impact results are allocated to the LOMA using tonnage by port as the proxy for port revenues and expenditures.
- **Tourism** – survey data on activity levels (days) and expenditures by province are available from Statistics Canada, Fisheries and Oceans Canada and industry sources for the three main tourism sectors: coastal tourism, recreational fishing and cruise ship travel. Activity is allocated to the LOMAs on the basis of sector-specific information. Location-specific survey data are used for coastal tourism and recreational fishing, while cruise ship travel relies on port of call data. These same factors are used to allocate provincial economic impacts.
- **Marine construction** – this activity applies to two sectors, oil & gas and ports & harbours. There is no single source for expenditure data for marine construction because this activity is captured within a broader construction category. Nonetheless, data are available from various sources including regulatory agencies for oil & gas, Fisheries and Oceans Canada for small craft harbours, port authorities for major port construction, and National Defence for naval installations. The overall estimate is considered conservative because data on private investment in marine facilities are excluded. Provincial impacts are allocated to the LOMAs based on known locations of investment activity (ports, naval installations and oil & gas developments). Marine construction also includes submarine cables, though these are not considered as part of this study.
- **Shipbuilding and boat building** – this primarily land-based activity includes two separate industries: shipbuilding and repair and boat building. The activity arises from demands from marine uses such as fishing, tourism, commercial transportation and research. Industry statistics on ship & boat building and repair are produced by Statistics Canada. Provincial activity and impacts are allocated to the LOMAs based on location information obtained from various sources including Industry Canada, ship and boat building associations and provincial governments. Due to limitations arising from confidentiality restrictions, revenue and impact information are reported for these activities as though they were a single industry.
- **Federal and provincial departments and agencies** – provincial-level data are obtained directly from the departments and agencies, and allocated to the LOMAs by proportioning various industry-specific allocation factors to these aggregate provincial amounts. For example, DFO spending is allocated on the basis of the share of landed value accounted for by the LOMA. The overall percentage is then allocated towards the economic impacts to the LOMAs. This approach works for most departments, but not National Defence because there is no readily available indicator to determine activity within a particular area along the coast. Some of the bases falling within a LOMA (eg, CFB Halifax in ESSIM), though much of the actual activity (sea and air patrols) occurs all along the Canadian coast. In the absence of an

indicative allocation factor, the report arbitrarily allocates 75% of NL DND spending to PB/GB; 50% of NS DND spending to ESSIM; and, 25% of BC DND spending to PNCIMA.

- **Universities and ENGOs** – provincial-level data (only 2006 data are available) are obtained directly from the universities and organizations, and allocated to the LOMAs based mainly on the location of campuses/offices. Universities and ENGOs are unable to provide reliable estimates for assigning program and activity expenditures on a geographic basis.

III

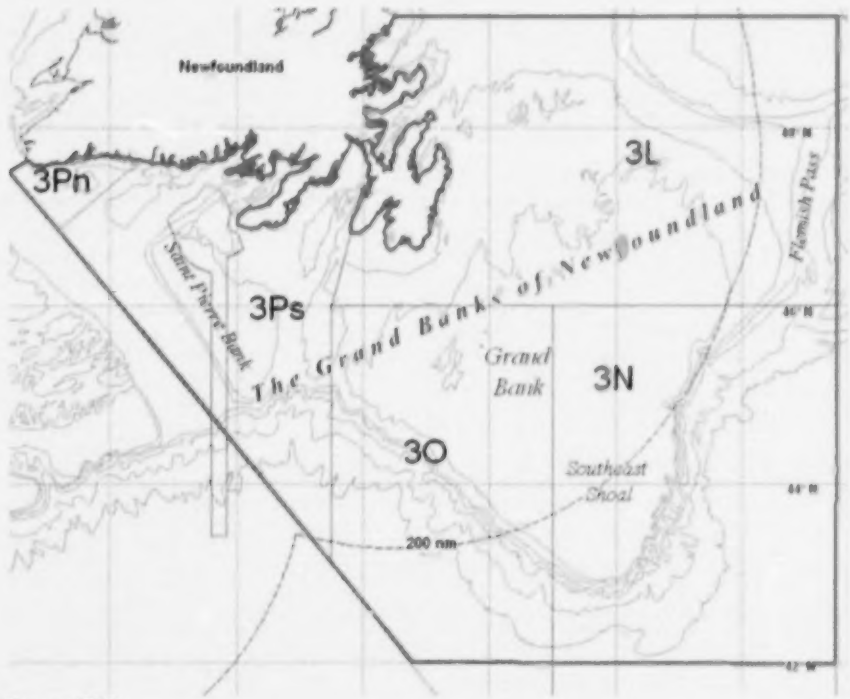
PLACENTIA BAY/GRAND BANKS LARGE OCEAN MANAGEMENT AREA

1. The area

The Placentia Bay/Grand Banks (PB/GB) initiative is one of five priority Large Ocean Management Areas (LOMAs) identified under the Ocean Action Plan for integrated management planning. The LOMA (Figure 3.1), covers an area of about 500,000 square kilometers, extending from Cape Ray on the Southwestern part of the province to Cape Freels on the North East Coast and including the Grand Banks beyond the 200-mile limit to the edge of the continental shelf.

The area's rich marine ecosystem supports various resource-based activities including fishing, aquaculture, oil and gas production, water transportation and tourism. These activities generate substantial employment and income, making major contributions to the economic health of the province and sustaining many adjacent coastal communities.

Figure 3.1: Placentia Bay/Grand Banks (PB/GB) Large Ocean Management Area



Source: DFO

2. Methodology

This report provides an overview of the range of human activities occurring in the PB/GB LOMA, and quantifies these activities using various industry-specific indicators. The report extends this analysis by providing an estimate of the economic impact of these activities in terms of their contribution to gross domestic product, employment and household income. The report also provides an overview of the interactions between and among the various activities.

Estimating the economic impact of ocean activities for the PB/GB LOMA is carried out in three steps.

- First, DFO planning documents providing an overview of the nature and extent of human activities are reviewed and synthesized.* To ensure consistency with statistical databases, the North American Industrial Classification System (NAICS) is used to categorize industries.
- Second, for each of the activities, industry and economic data are compiled or estimated from statistical sources and government departments. The challenge in this step is to ensure on the one hand that the data capture only activities occurring within the LOMA boundary, and on the other hand ensuring the data accurately reflect the extent of each activity. Unless otherwise indicated in the text, activities are quantified using a bottom-up approach based on location-specific data. For example, the estimate of the economic significance of the fisheries is based on catch and effort data by fishery for statistical areas within the LOMA. Similarly, estimates for ports and shipping are based on port-specific cargo levels and vessel movements.
- Third, a top-down approach is used to estimate the economic impact (GDP, employment, household income) of LOMA activities. This approach starts with provincial impacts and assigns or distributes them to the LOMA using an indicator linking activity and location (e.g., share of landings in the case of fisheries, or share of cargo tonnages in the case of shipping).

3. Human activity

Fishing

Fishing activity has a long history of economic importance within coastal communities in the PB/GB LOMA. Fishing within the LOMA accounts for approximately 65% of total provincial landed value and is comprised of a diverse range of species including shellfish, groundfish, pelagics and marine mammals. Between 2002 and 2007 total commercial landed values averaged just under $360 million (Table 3.1). The rise and fall in landed value shown in Table 3.1 is attributable mainly to swings in crab landings and markets, with the decline in the value of the U.S. dollar also playing a significant role after 2004.

Table 3.1: Commercial landings and landed value from the PB/GB LOMA, 2002-2007[1]

Landings	2002	2003	2004	2005	2006	2007
Tonnes	157,000	175,000	202,000	196,000	219,000	202,000
Value ($000)	348,000	386,000	424,000	330,000	304,000	354,000

1. See Note 1

Hollett and Sons Inc., *Social Economic and Cultural Overview and assessment of the Placentia Bay/Grand Banks Large Ocean Management Area*, Prepared for Fisheries and Oceans Canada, Newfoundland and Labrador Region, 2008; Rahman, F., *Integrated Management in Placentia Bay – Characteristics of Marine Boundaries and Marine Boundary Information Required to Support Coastal and Marine Governance in Placentia Bay*, Prepared for Fisheries and Oceans Canada, 2005; Fisheries and Oceans Canada, *The Grand Banks of Newfoundland: Atlas of Human Activities*, 2007.

Prior to the collapse of various groundfish stocks in the early 1990s, species such as cod, redfish and small flounders comprised most of the catch on the Grand Banks. The collapse of the groundfish resource caused a downsizing of the industry, forcing thousands out of work. But almost as swiftly as the groundfish economy disintegrated, a fishing economy based on shellfish emerged and eventually surpassed groundfish in terms of landed value. Shellfish species (crab in particular) currently account for approximately 80% of total landed value in the region.

In 2006, fisheries within the LOMA provided employment for an estimated 6,000 fishers (about 50% of the provincial total), operating from 4,400 registered fishing vessels (Table 3.2).

Table 3.2: Employment and active fishing vessels in the PB/GB LOMA, 2006

	Number employed[1]	Number of registered fishing vessels[2]
Fisheries	6,000	4,400

1. See Note 2
2. See Note 3

Aquaculture

Aquaculture in the LOMA accounts for approximately $30 million in production value out of a provincial total of just over $50 million. It is comprised of about 60 sites producing mainly salmonids (Atlantic salmon, steelhead trout, rainbow trout) and mussels (Table 3). Salmonid production is concentrated in Bay D'Espoir, where aquaculture activity in the PB/GB area is centred. Aquaculture production of Atlantic Cod is in the developmental stage.

Strong growth in demand for aquaculture products and abundant habitat for key species have contributed to the growth of the industry in Newfoundland and Labrador. Overall, the industry produced approximately 8,000 tonnes of salmonids and mussels, and employing about 200 in production activities in 2006 (Table 3.3).

Table 3.3: Aquaculture activity for PB/GB LOMA, 2006[1]

	Number employed	Number of Sites	Product value ($ Million)
Aquaculture	200	60	30.0

1. See Note 4

Fish processing

The fish processing industry in the PB/GB LOMA consists of approximately 80 facilities (out of a provincial total of 130), ranging widely in processing capacity, species used, product form and value, and employment.

Up to the early 1990s, groundfish landings dominated the industry, providing the main driver for the number, size and location of processing plants, as well as the key component of the economic base of the many dependent communities. The collapse of the groundfish stocks caused most of these plants to close and others to convert to crab processing.

The closures, coupled with increasing capital intensiveness of the industry, caused the numbers employed in the processing industry to drop by more than 50% between 1992 and 2006. The much smaller processing sector now consists of mainly crab and shrimp plants, with a few plants continuing to process groundfish and pelagic species (mainly capelin).

In 2006, the 80 fish processing plants in the LOMA generated about $565 million in product value (Table 3.4).

Table 3.4: Fish processing activity in the PB/GB LOMA, 2006

	Number employed[1]	Number of Plants[2]	Production ($ Million)[3]
Fish processing	4,500	80	565

1. See Note 5
2. See Note 6
3. See Note 7

Oil & Gas exploration and extraction

Offshore oil and gas in Newfoundland and Labrador is one the major industries in the province, generating revenues in the $8 billion range in 2006, with $1.3 billion in average annual expenditures between 2000 and 2006 (Table 3.5). The industry accounted for approximately 25% of provincial GDP and 2% of total employment in 2006. Currently, three oil fields are in production (Hibernia, Terra Nova and White Rose), with one in the planning stage (Hebron).

- **Hibernia**
  The Hibernia field is located about 315 km east southeast of St. John's Newfoundland and Labrador in the Jeanne d'Arc Basin. It was discovered in 1979, with field development taking place during the early 1990s. In 2007, the field generated annual operating expenditures of $404 million, 60% of which was spent in Newfoundland and Labrador. Hibernia generates direct employment for 920 people, 91% of whom are provincial residents (Table 3.6).

- **Terra Nova**
  The Terra Nova field, discovered in 1984, is located 350 km east southeast of St. John's Newfoundland and Labrador in the Jeanne d'Arc Basin. In 2007, the field generated annual operating expenditures of $364 million, 57% of which was spent in Newfoundland and Labrador. It generates employment for 593 people, 94% of whom are provincial residents (Table 3.6).

- **White Rose**
  The White Rose field, discovered in 1984, is located 350 km east of St. John's Newfoundland and Labrador in the north-eastern margin of the Jeanne d'Arc Basin. In 2007, the field generated annual operating expenditures of $404 million, 50% of which is accounted for by spending in Newfoundland and Labrador. It generates employment for 1,015 people, 89% of whom are provincial residents (Table 3.6).

- **Hebron**
  Discovered in 1981, the Hebron field is currently in the development planning stage. It is located 340 km off Newfoundland and Labrador and is estimated to contain 400 to 700 million barrels of crude oil. Hebron is expected to be in production between 2016 and 2018.

Table 3.5: Oil & gas industry expenditures and revenues for PB/GB LOMA, 1990-2006 ($ Millions)[1]

	Exploration	Pre-Development	Development	Production	Total	Revenues
1990	37.9	4.2	60.9		103	
1991	50.3	2.8	359		412.1	
1992	0	0	534.5		534.5	
1993	0	0	879.8		879.8	
1994	0	0	1,276.5		1276.5	
1995	10.2	2.9	1,377.2		1390.3	
1996	0.7	12.9	705.9		719.5	
1997	73.9	100.1	539.3	68	781.3	33
1998	64.5	0	536	299	899.5	449
1999	251.8	1.3	922	309.5	1,484.6	967
2000	156.1	25	865	320.7	1,366.8	2,247
2001	30.6	71.9	559	375	1,036.5	2,056
2002	55.2	5.4	487.4	749.7	1,297.7	4,082
2003	99.8	0	551	715.1	1,365.9	4,994
2004	19.4	10.8	606	690.6	1,326.8	5,681
2005	113.7	22.4	414	789.7	1,339.8	7,387
2006	180.2	57.4	0	1,344.6	1,582.2	8,108

1. See Note 8

Table 3.6: Oil & gas industry expenditures for PB/GB LOMA, 2007[1]

	Development ($Billions)		Production ($ Millions)		Employment (persons)	
	Total Expenditure	Newfoundland & Labrador Expenditure	Total Expenditure	Newfoundland & Labrador Expenditure	Total	Newfoundland & Labrador residents
Hibernia	$5.80	$2.73	$404	$242.40	920	841
Terra Nova	$2.80	$0.77	$364	$207.48	593	557
White Rose	$2.0	$0.81	$404	$202.0	1015	909
Total	**$10.64**	**$4.31**	**$1,172**	**$651.88**	**2,528**	**2,307**

1. See Note 9

Oil and gas support services

The offshore oil and gas industry relies heavily on a wide range of services to support exploration, development and extraction (production). These services include engineering and project management, fabrication and construction contracting, logistics (supply vessel and helicopter support), transshipment terminal operations, various oil field technical and environmental services, maintenance contracting, catering, insurance and professional services including legal and accounting.

Contractors and companies resident in Newfoundland and Labrador supply many of these services, with most of them operating from facilities within the LOMA boundary. Obtaining data on the size of the service industry is complicated because the industry does not conform to a standard classification for which data are compiled and reported.

In the absence of such data, it is nonetheless possible to make an estimate based on expenditure information in Table 3.6. Netting out annual wages and salaries earned in direct employment (estimated at $175-200 million based on employment and average incomes) from total expenditures in Newfoundland and Labrador ($651 million in 2007), the projects would appear to support an industry producing up to $450-475 million in goods and services annually. It should be emphasized that these are recurrent expenditures linked to on-going production. This figure would increase during field development.*

Marine Transportation

The geography and industrial structure of Newfoundland and Labrador (many coastal communities and resource-based) mean that water transportation plays a crucial role in the provincial economy. Cargo handled by ports in the LOMA (57.1 million tonnes in 2005, Table 3.7) accounts for 95% of total cargo handled in the province. Driven primarily by the transport of crude petroleum and refined products, Come-By-Chance handled just over two-thirds of the area's total cargo. St. John's is the major container port. Many of the ports throughout the PB/GB LOMA offer a variety of support services including towing, communication, ships chandlery and pilotage.

Marine traffic through the LOMA and cargo shipments through the area's ports are expected to increase over the next several years as the Hebron development comes on stream and a nickel processing plant is developed in Long Harbour in Placentia Bay. Operated by Voisey's Bay Nickel Company, the initiative would be operational by 2011 and would generate about 450 jobs.

Table 3.7: Vessel movement and tonnes of cargo, 2005[1]

	Domestic		International		Total	
	Vessel Movement	Tonnes of Cargo (000s)	Vessel Movement	Tonnes of Cargo (000s)	Vessel Movement	Tonnes of Cargo (000s)
PB/GB	3,394	34,804	643	22,340	4,037	57,144

1. See Note 10

Ferry services in the PB/GB LOMA consist of various routes that meet the transportation needs of residents and non-residents. The sector is comprised of both regular and seasonal passenger/ vehicle/commercial transportation support operated by Marine Atlantic Inc and the Government of Newfoundland and Labrador.

- **Marine Atlantic** – The federal Crown Corporation operates two ferry service routes: 1) Port aux Basques to North Sydney (operates year round), and 2) Argentia to North Sydney (operates between June and September). The corporation has three vehicle ferries, one commercial ferry freighter and one new ferry that entered service in 2009.
- **Government of Newfoundland and Labrador** – Operates numerous routes throughout the province varying from small daily passenger/freight to seasonal auto/passenger/ freight transportation services. Nine vessels operate in PB/GB LOMA linking numerous coastal communities. In addition, the provincial government is currently planning to construct two new medium-sized ferries in the province, one of which will be in operation within the LOMA.

In 2006, ferry services in the area carried approximately 700,000 passengers, 200,000 vehicles and employed about 750 people (Table 3.8).

* Production impact estimates are based on revenues. Development impacts are based on capital expenditures for facilities and installation.

Table 3.8: Ferry Industry for PB/GB LOMA, 2006[1]

	Employment	Passengers	Vehicles
Ferry Industry	750	700,000	200,000

1. See Note 11

With the LOMA accounting for 95% of freight traffic and 60% of ferry traffic, and freight generating greater economic activity, the overall weighting of marine transportation impacts is estimated at 90% of the provincial total.

Ocean-based tourism

Ocean tourism is broken down into three expenditure-driven areas: cruise ship activity, coastal tourism in the form of water-based recreational activities, and marine recreational fishing. These three activities are well defined and some attempt has been made to quantify their economic significance based on various reports and surveys. Overall, ocean tourism in the LOMA accounts for an estimated $160 million in spending annually out of a provincial total of just over $232 million.

Cruise ship activity in the PB/GB LOMA is a growing industry that generates approximately $1.5 million expenditures (Table 3.9). According to the Newfoundland and Labrador Department of Tourism, Culture and Recreation *Performance and Outlook 2008* report, approximately 25 port calls were made throughout the area during the 2007 cruise season. Led by the Port of St. John's, passenger visits in the LOMA reached 9,500, accounting for approximately 25% of the provincial passenger traffic.

The port of St. John's plays a key role in the overall economic contribution of the cruise industry to Newfoundland and Labrador. It is one of the most active cruise ship ports in the province, averaging about 10,000 passenger visits between 2004 and 2007 (Table 3.10). It attracts visitors from the Canada-New England and Transatlantic markets and is currently involved in marketing efforts aimed at the European market.

Table 3.9: Direct Cruise-related Expenditures for PB/GB LOMA, 2002-2007 ($ Millions)[1]

	2002	2003	2004	2005	2006	2007
PB/GB	1.0	1.0	1.0	1.0	1.5	1.0

1. See Note 12

Table 3.10: Cruise ship traffic in ports within the Port of St. John's[1]

	2004	2005	2006	2007
Number of Port Calls	17	17	19	14
Passenger Visits	6,338	11,957	14,724	8,696
Crew Visits (Approx.)	5,822	6,240	7,247	4,692

1. See Note 13

The 2000 and 2005 *Surveys of Recreational Fishing in Canada* indicate that expenditures by those engaged in saltwater fishing in Newfoundland and Labrador generate an estimated $40 Million in 2006. The LOMA accounts for approximately 60% of the total (Table 3.11).

Table 3.11: Saltwater fishing expenditures for PB/GB LOMA, 2002-2006 ($Millions)[1]

	2002	2003	2004	2005	2006
PB/GB	28	27	26	25	24

1. See Note 14

Coastal tourism includes ocean touring (whale watching, sightseeing, coastal hiking, diving and kayaking), as well as sailing, cruising and visiting beaches and other marine locations. Statistical agencies and departments of tourism in Canada do not systematically track and report demand and expenditures for these activities. Nonetheless, it is possible to develop an estimate of coastal tourism expenditures using various surveys and studies (see Appendix 2). These surveys identify specific marine activities and by linking average daily expenditures to days spent in these activities (based on survey results) within the LOMA, an aggregate expenditure level may be estimated.

Following this methodology, Table 3.12 reports that participation in coastal activities in the province generated an estimated $190 million in tourism expenditures (about $137 million or 72% of which occurred in the LOMA). It should be noted that this estimate includes expenditures by tourists and local residents.

Table 3.12: Coastal tourism expenditures for PB/GB LOMA, 2002-2006 ($Millions) [1]

	2002	2003	2004	2005	2006
PB/GB	n.a.	n.a.	n.a.	n.a.	137

1. See Note 15

Marine construction

Marine construction does not conform to a NAICS industry for which data are readily available. This activity includes building wharves and breakwaters, as well as dredging operations. Construction is conducted by port authorities and operating companies at major ports, and also by DFO and local authorities at small craft harbours. It also includes installation (and outfitting) of production facilities and sub-sea systems for the offshore oil and gas industry. Marine construction also includes submarine cables, though these are not considered as part of this study. For the LOMA as a whole, annual construction expenditures averaged about $162 million over the 2002-2006 period (Table 3.13).

- **Ports** – The St. John's Port Authority is the only port authority in the province. Capital spending averaged $2.0 million over the period.
- **Small Craft Harbours** – The program is comprised of over 300 fishing harbours throughout the province, with about 50% located within the LOMA. Based on this proportion, capital expenditures in 2006 were estimated to be about $6 million.
- **National Defence** – upgrading of St. John's facility.
- **Oil & Gas** – development of facilities in the field.

Table 3.13: Ports & harbours capital expenditures for PB/GB LOMA, 2002-2006 avg.

	Capital Expenditures ($ Millions)
St. John's Port[1]	2.0
Small Craft Harbours[2]	6.0
National Defence[3]	4.0
Oil & Gas[4]	150.0
Total	162.0

1. See Note 16
2. See Note 17
3. See Note 18
4. See Note 19

Future marine construction in the LOMA includes the marine facilities at Long Harbour for the proposed plant to process Voisey's Bay nickel, and a proposed liquefied natural gas (LNG) transshipment and storage terminal for Grassy Point, Placentia Bay. A refinery (including marine terminal) adjacent to the existing one at Come-By-Chance has also been proposed, though no date has been established for its construction.

Shipbuilding and boat building

The ship and boat building industry in Newfoundland and Labrador is comprised of two shipyards within the LOMA (Marystown and St. John's) and 25-35 boat-builders scattered around the province. Industry Canada data shows that as recently as 2006, the industry generated revenues in the $68 million range (Table 3.14), with just over 40% ($28 million) occurring in the LOMA.

Table 3.14: Ship & boat building industry in Newfoundland and Labrador, 2002-2006[1]

	2002	2003	2004	2005	2006
Number of companies	-	-	40	36	34
Revenues ($Million)	36	75	50	67	68

1. See Note 20

Due to the insufficient data on navigation and guidance equipment, this report captures only the impact of the ship and boat building sector.

Government services

Several federal and seven provincial government departments and agencies in Newfoundland and Labrador play a role in the protection and management of the marine environment. They contribute to the value of the ocean sector in a number of ways: direct employment, capital spending, operations and maintenance spending, spending on research and development, and in the support of initiatives in the non-profit and not-for-profit sectors.

Since LOMA-specific employment and expenditures are not available, estimates were obtained by proportioning various industry-specific allocation factors to aggregate provincial amounts. Overall, ocean-related governmental services generated approximately $196 million in expenditures and 1,300 full-time equivalent jobs in 2006 (Table 3.15). Government impact excludes expenditures and employment captured under other marine activities such as transportation (ferries). See Appendix 2, Table A2-1 for details on allocation factors.

Table 3.15: LOMA Expenditure and Employment of Major Federal and Provincial Departments, 2006

Governments	Employment (FTE)	Expenditures ($ Million)
Federal[1]	1,200	180
Provincial[2]	100	16
Total	1,300	196

1. See Note 21
2. See Note 22

Universities and ENGOs

Memorial University and some of its affiliated institutes offer programs and conduct research in the marine area. National and local Environmental NGOs also pursue marine programs. Estimates of program and research expenditures are available at the provincial level, though reliable estimates of activity and spending within the LOMA are not available. In the absence of this detail, given the location of the Memorial campus and research facilities and the offices of ENGOs (adjacent to the LOMA), and given the relative significance of marine activities within the LOMA (eg, fisheries and oil & gas), we notionally allocate 50% of marine expenditures to the LOMA.

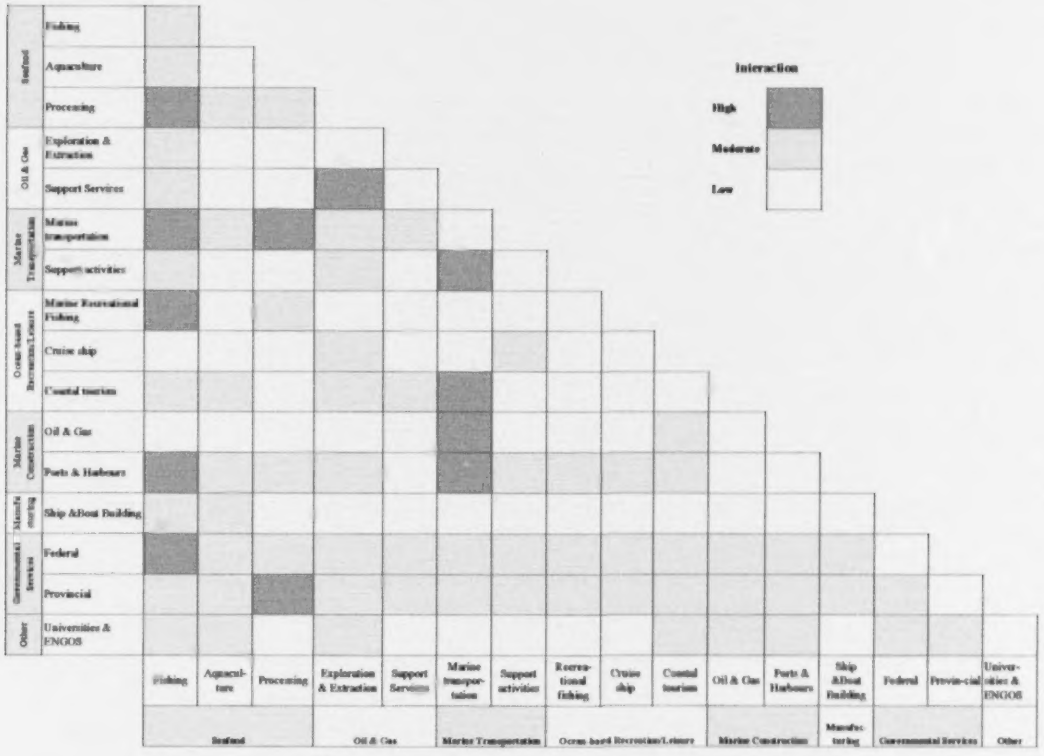
4. Interactions

This high-level discussion of interactions is qualitative in nature. The interactions focus on the existence of economic interdependence (negative or positive) between or among activities. Many negative interactions between and amongst activities are low to moderate, reflecting in part the physical separation of most activities. Where there had been conflicts, these have been resolved or minimized over the years, either through the cooperation of the interests or through policy and regulation. Some activities are positively linked, with one activity reinforcing or building on another. Interactions are summarized in the matrix below, with relative intensity indicated by shading (white=weak; black=strong). Among the highlights:

- **Fishing** – gear conflicts are minimized by seasons and zones. The strong interaction with fish processing reflects the mutual dependence of the industries. Competition for marine space is minimal with oil & gas, since the latter covers a relatively small area and does not occur in major fishing grounds. Fishing depends heavily on marine transportation to ship product, but also competes for ocean space where shipping lanes run through fishing grounds (e.g., Placentia Bay). The fishery depends heavily on small craft harbours for berthing and facilities to unload and load vessels. The fishery provides an important market for the boatbuilding industry. A strong interaction with the federal government arises from the Fisheries and Oceans Canada mandate for fisheries management.
- **Aquaculture** – competition with commercial fisheries for ocean space is minimal, though could change if groundfish stocks recover and the inshore trap fishery resumes. There is moderate interaction with transportation arising from the need to avoid pens and lines. Aquaculture provides a market for the boatbuilding industry. A moderate interaction with the provincial government arises from the Fisheries and Aquaculture mandate for licensing and regulation.
- **Processing** – there is a strong backward linkage to fishing, particularly the crab and shrimp fisheries, with a moderate linkage to aquaculture. The system of small craft harbours facilitates landing and trucking raw material from remote sites to processing plants. Water transportation is vital for shipping finished product. A strong interaction with the provincial government arises from the Fisheries and Aquaculture mandate for policy, licensing and regulation.
- **Oil & gas** – there is minimal spatial conflict with the fishery because activity occurs on the Grand Bank in areas where fishing effort has traditionally been light. The growth of oil & gas activity provides some competition for human resources with fisheries and other marine industries. The industry relies heavily on support activities provided by local companies including weather forecasting and supply vessel/helicopter logistics. The federal and provincial governments share regulatory responsibility through the Canada-Newfoundland and Labrador Offshore Petroleum Board.

- **Marine transportation** – depends strongly on port infrastructure and facilities, as well as support activities such as cargo handling and navigational services. Tourism benefits strongly from inter-provincial as well as coastal ferry services. Federal and provincial governments provide regulatory oversight, and also provide financial support for ferry services.
- **Ocean based recreation and leisure** – good port and harbour facilities are integral to all three components – recreational fishing, cruise ship and coastal tourism (e.g, whale watching, sailing/boating, kayaking, etc.). Aquaculture gear (pens and head ropes) may present hazards to navigation for other marine users including fisheries, recreational fisheries and coastal tourism.
- **Oil & gas construction** – Slow moving barges laden with modules and equipment present hazards to navigation requiring advanced notice to mariners. Offshore construction areas pose hazards to shipping and fishing that are addressed through exclusion zones.
- **Federal/provincial governments** – federal departments including Fisheries and Oceans Canada, Transport Canada and Environment Canada exercise regulatory authority over many ocean activities, with others covered by provincial departments including Fisheries and Aquaculture, Transportation and Tourism.

Economic Interdependence Matrix for the PB/GB LOMA



5. Current and future economic impacts

Ocean activity in the LOMA contributed about $9.6 billion in GDP to the Newfoundland and Labrador economy in 2006, creating 26,100 jobs and generating about $1.2 billion in total income (Table 3.16).

- **Fishing** – following a sharp contraction in the early 1990s with the collapse of groundfish stocks, the growth of shellfish resources has allowed the fisheries economy to regain (and even exceed) its former strength. The resource (mainly crab and shrimp) is healthy, though fully utilized, providing limited basis for expansion. Fluctuation in economic impact in the future is likely to be determined mainly by market conditions and exchange rates.
- **Aquaculture** – industry performance is encouraging, though there have been challenges arising mainly from competitive conditions in major markets. Salmon production seems to be once again on a solid footing in Bay D'Espoir, following some difficult years. The outlook is promising, as markets have gained strength. Mussel production is firmly established, and with considerably more suitable habitat, further expansion is expected. The main limiting factor is likely to be competition for market share from other producers in Atlantic Canada.
- **Processing** – The industry relies almost exclusively on locally-caught raw material and has had to adjust to changing species mix and resource conditions. There continues to be controversy about adding to processing capacity, with pressure to allow more plants into the industry even as utilization rates have not reached acceptable levels in some areas. The future economic impact hinges on resource conditions, as well as markets and exchange rates.
- **Oil & gas extraction** – this sector has grown steadily over the past decade and makes the largest contribution to economic impact in the LOMA. Three fields are in production, with a fourth in the advanced planning stage. They have created thousands of direct and indirect jobs and have injected hundreds of millions of dollars into the provincial economy. The provincial treasury has benefited greatly from the increases in oil prices over the past decade (and especially in the past two years). The abrupt drop in prices since August 2008 will cause royalties to decline. What impact current prices will have on the prospects for future developments is less clear, though a recovery in demand and prices is expected as economies climb out of recession.
- **Marine transportation** – this sector has strong backward linkages to several provincial industries including fish processing, mining, forestry and oil & gas. Much of the marine traffic through the provincial economy originates, terminates, or passes through the PB/GB LOMA. This traffic has increased substantially with offshore oil development, and will continue to expand as future fields come on stream and as mineral refining capacity is developed in Placentia Bay.
- **Tourism** – This is a potential growth sector for the economy, with the expansion of adventure tourism and the evolution of the cruise ship industry.
- **Marine construction** – Activity levels are tied closely to offshore oil development, both with respect to the construction/installation of offshore platforms and vessels, and also the outfitting of topside facilities. Construction at ports and fishing harbours tends to be a fairly steady activity, though major projects are expected to increase economic impact over the next few years.
- **Ship and boatbuilding** – This industry is tied mainly to the demand for fishing vessels, with demand expected to be fairly constant over the next few years.

Table 3.16: Economic impact of marine activities in the PB/GB LOMA, 2006

GDP and Income in $000s Employment in full-time equivalent	NL total output value	LOMA allocation	Direct			Indirect			Induced			Total		
Marine activity	$000s (1)	factor (2)	GDP	Employment	Income	GDP	Employment	Income	GDP	Employment	Income	GDP	Employment	Income
Commercial fishing	468,474	0.65	130,938	1,390	88,307	36,541	582	18,270	36,845	414	26,644	204,325	2,385	133,222
Aquaculture	52,289	0.60	14,118	148	3,765	5,961	82	2,824	4,417	48	1,647	24,496	279	8,236
Fish processing (3)	870,484	0.65	141,454	2,937	96,188	112,031	1,543	37,344	43,319	694	23,764	296,804	5,174	157,296
Oil & gas exploration/extraction	8,108,000	1.00	6,891,800	2,787	186,484	891,880	1,429	64,864	389,184	886	37,702	8,172,864	5,102	289,050
Support activities for oil & gas	186,000	1.00	85,560	488	35,340	35,340	271	13,020	26,598	160	11,160	147,498	919	59,520
Water transportation	222,600	0.90	70,119	1,374	60,102	26,044	510	12,020	21,156	396	18,031	117,319	2,279	90,153
Support activities for transportation	212,000	0.90	104,940	2,149	78,228	19,080	508	11,448	27,284	558	22,419	151,304	3,215	112,095
Tourism & recreation	232,592	0.70	65,126	1,754	45,588	48,844	957	35,819	25,073	569	20,352	139,043	3,280	101,759
Oil & gas facilities construction	165,714	1.00	74,571	514	41,429	16,571	260	9,943	20,051	163	12,843	111,194	937	64,214
Ports and harbours construction	13,229	0.60	3,175	47	2,064	1,587	16	556	1,048	13	655	5,810	75	3,274
Ship and boat building	69,000	0.40	8,460	205	6,120	1,440	24	540	2,178	48	1,665	12,078	278	8,325
National Defence	55,400	0.75	18,698	221	18,698	14,543	102	2,909	7,313	68	4,363	40,553	391	25,969
Fisheries & Oceans	204,792	0.65	63,895	932	63,895	35,941	119	9,318	21,964	221	18,303	121,800	1,271	91,516
Other federal departments	9,400	0.86	5,335	54	5,335	1,213	18	566	1,441	15	970	7,989	87	6,871
Provincial departments	25,252	0.57	10,076	87	10,076	2,159	41	2,159	2,692	27	1,403	14,926	154	13,638
Universities & ENGOs	46,515	0.50	16,065	214	12,623	3,443	51	1,377	4,292	56	3,500	23,799	320	17,499
Total	10,473,267		7,704,330	15,301	754,241	1,252,618	6,513	222,976	634,855	4,334	205,421	9,591,803	26,147	1,182,639

1. See Gardner Pinfold, *Economic Impact of Marine Related Activities in Canada*, 2009, (prepared for DFO) for sources and derivation of output values.
2. See Appendices 1 and 2 for derivation of allocation factors.
3. Fish processing impacts have been adjusted to remove double counting of indirect and induced impacts of commercial fishing.

IV

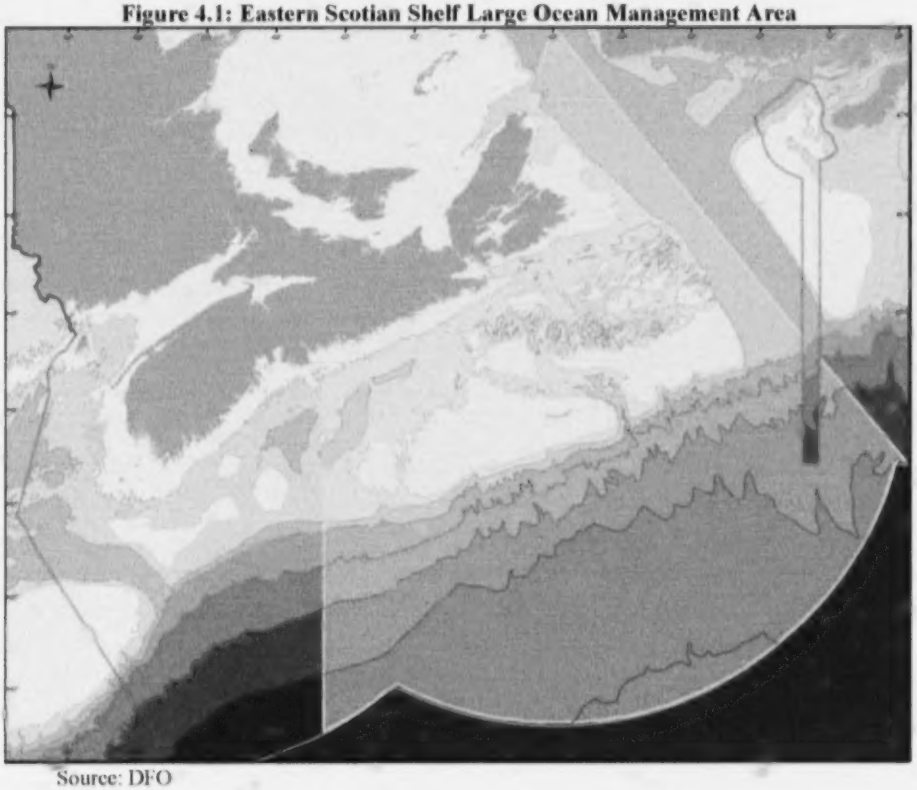
EASTERN SCOTIAN SHELF INTEGRATED MANAGEMENT AREA

1. The area

The Eastern Scotian Shelf Integrated Management (ESSIM) Area forms a sub-area of the Scotian Shelf LOMA, one of five priority Large Ocean Management Areas identified under the Ocean Action Plan for integrated management planning. ESSIM (Figure 4.1) covers about two-thirds of the Scotian Shelf, encompassing approximately 325,000 square kilometres, corresponding with Northwest Atlantic Fisheries Organization (NAFO) fisheries management division 4VW.

The area's rich marine ecosystem supports various resource-based activities including fishing, aquaculture, oil and gas production, water transportation and tourism. These activities generate substantial employment and income, making major contributions to the economic health of the province and sustaining many adjacent coastal communities.

Figure 4.1: Eastern Scotian Shelf Large Ocean Management Area



Source: DFO

2. Methodology

This report provides an overview of the range of human activities occurring in the ESSIM Area, and quantifies these activities using various industry-specific indicators. The report extends this analysis by providing an estimate of the economic impact of these activities in terms of their contribution to gross domestic product, employment and household income. The report also provides an overview of the interactions between and among the various activities.

Estimating the economic impact of ocean activities for the ESSIM Area is carried out in three steps.

- First, DFO planning documents providing an overview of the nature and extent of human activities are reviewed and synthesized.* To ensure consistency with statistical databases, the North American Industrial Classification System (NAICS) is used to categorize industries.
- Second, for each of the activities, industry and economic data are compiled or estimated from statistical sources and government departments. The challenge in this step is to ensure on the one hand that the data captures only activities occurring within the ESSIM Area boundary, and on the other hand that the data accurately reflect the extent of each activity. Unless otherwise indicated in the text, activities are quantified using a bottom-up approach based on location-specific data. For example, the estimate of the economic significance of the fisheries is based on catch and effort data by fishery for statistical areas within the Area. Similarly, estimates for ports and shipping are based on port-specific cargo levels and vessel movements.
- Third, a top-down approach is used to estimate the economic impact (GDP, employment, household income) of ESSIM Area activities. This approach starts with provincial impacts and assigns or distributes them to the Area using an indicator linking activity and location (e.g., share of landings in the case of fisheries, or share of cargo tonnages in the case of shipping).

3. Human activity

Fishing

Fishing activity has a long history of economic importance within coastal communities in the ESSIM Area. Fishing within the Area accounts for an estimated 14% of total provincial landed value and is comprised of a diverse range of species including shellfish, groundfish, pelagics and other smaller marine fisheries. Between 2002 and 2006, total commercial landed value averaged just under $104 million (Table 4.1). The rise and fall in landed value are attributable mainly to swings in crab landings and markets, with the decline in the value of the U.S. dollar also playing a significant role after 2004.

Table 4.1: Commercial landings & landed values from the ESSIM Area, 2002-2006[1]

Landings	2002	2003	2004	2005	2006
Tonnes	29,000	22,000	26,000	24,000	27,000
Values ($ 000)	104,000	118,000	113,000	97,000	89,000

1. See Note 1

Fisheries and Oceans Canada, "The Scotian Shelf: An Atlas of Human Activities", http://www.mar.dfo-mpo.gc.ca/oceans/e/essim/atlas/other-e.html, 26/12/2007; DFO, *ESSIM Management Plan and Assessment of Quantitative and Qualitative Data and Information from the Social, Economic and Cultural Overview and Assessment of the Scotian Shelf.*

Up until the early 1990s, groundfish landings led by cod, dominated the Nova Scotia fishery. Between 1991 and 1995, groundfish landings dropped by 80%. The collapse of the groundfish resource caused a downsizing of the industry, forcing thousands out of work. Groundfish stocks have shown no signs of recovery (with the exception of haddock on Georges Bank).

An increase in shellfish resources more than offset the collapse of groundfish from a purely economic standpoint. By 1996, shellfish landings had overtaken groundfish as the main contributor, and by 2005 accounted for over 85% of total landed value in the region. Key species include lobster, scallop, surfclam and snow crab.

In 2007, fisheries within the ESSIM Area provided employment for an estimated 3,100 fishers operating from 1,200 fishing vessels (Table 4.2).

Table 4.2: Employment and active fishing vessels in the ESSIM Area, 2007

	Employment[1]	Number of Active Vessels[2]
Fishing	**3,100**	**1,200**

1. See Note 2
2. See Note 3

Aquaculture

Aquaculture in the ESSIM Area accounts for approximately $3.5 million in production value out of a provincial total of just over $50 million. It is comprised of about 139 sites producing mainly salmon, mussels and oysters (Table 4.3). Developing species include Arctic char, halibut, scallop, striped bass, quahog and European oyster.

Aquaculture operators in the ESSIM Area produced approximately 2,400 tonnes of product, and employed about 200 in production activities in 2007 (Table 4.3). Industry growth is constrained in part by limited habitat for valuable species such as salmon, and in part by difficulty securing sites due to conflict with commercial fisheries (mainly lobster).

Table 4.3: Aquaculture activity for the ESSIM Area, 2006[1]

	Number employed	Number of sites	Production value ($ 000)
Aquaculture	**200**	**139**	**3,500**

1. See Note 4

Processing

The fish processing industry in the ESSIM Area consists of approximately 43 active facilities (out of a provincial total of 180), ranging widely in processing capacity, species used, product form and value, and employment (Table 4.4).

Based on the 2007 Nova Scotia Seafood Processing Sector study, the industry in the area is comprised of:

- 26 licence-holders that conduct processing as defined in regulation: cleaning, filleting, icing, packing, canning, freezing, smoking, salting, cooking, pickling, drying or preparing fish for market;

- 6 licence-holders that conduct activities that are confined to shipping lobster. They buy and hold lobster in dry land or tidal pounds, shipping them to market as demand warrants. They conduct no processing, other than sorting and packing lobster for shipment.
- 8 licence-holders that classify themselves as buyers and sellers only. They simply act as intermediaries for processors or shippers, buying at the wharf and transporting to a plant in Nova Scotia or outside the province. Buyers may be independent or agents of a particular licence-holder. Buyers are most common in the lobster and crab sectors.
- 2 plants that are engaged primarily in the wholesale-retail trade. These facilities conduct conventional processing activities, but the bulk of their sales revenue is derived from wholesale-retail trade.
- 1 plant provided insufficient information to allow categorization.

Three-quarters of those 43 active facilities report shellfish as their predominant source of sales revenue. For most plants lobster is the main or exclusive source of revenue, while several report crab or scallop as the main revenue generator. This has changed significantly since the early 1990s when groundfish processing dominated the industry. The number of processing facilities in Nova Scotia has declined from over 400 licensed facilities in the early 1990s to 180 active companies in 2006.

In 2006, seafood processing in the ESSIM Area generated roughly $126 million in output value and employed 1,700 employees at peak time (Table 4.4).

Table 4.4: Fish processing activity in the ESSIM Area, 2006

	Number employment[1]	Number of Plants[2]	Production ($ Million)[3]
Fish Processing	**1,700**	**43**	**126**

1. See Note 5
2. See Note 6
3. See Note 7

Oil & Gas exploration and extraction

Offshore oil and gas in Nova Scotia is one of the major industries in the province, generating revenues in the $1.0 billion range in 2006. To date, petroleum production in the province has included three offshore projects including Cohasset-Panuke project, Sable Offshore Energy project and Deep Panuke Offshore Gas Development Project.

- **Cohasset-Panuke project** – was the first offshore oil development on Canada's East Coast. This relatively small oil project began production in 1992 and ended in 1999 with the field producing about 45 million barrels of light oil. The project had a capital cost of about $500 million and annual operating costs in the $110 million range.

- **Sable Offshore Energy project** – is a $3 billion initiative operated by ExxonMobil Canada Ltd and partners. It consists of six fields near Sable Island and is Nova Scotia's first major offshore project. After experiencing a rough start due to inadequate market conditions, production finally commenced in late 1999. The project is being developed in two phases (tiers). Tier 1 ties in three fields (Thebaud, Venture and North Triumph), with average daily production in the range of 400-550 million cubic feet. Tier 2 includes development of Alma, South Venture and Glenelg field, which is presently under review by ExxonMobil Canada Ltd and partners. In 2006, the Sable Offshore Energy project generated $463 million in expenditures of which about 42% is based in Nova Scotia (Table 4.5).

- **Deep Panuke Offshore Gas Development Project** – is a proposed $700 million initiative operated by EnCana Corporation and partners with the intention of extracting natural gas from the offshore Deep Panuke field, located approximately 250 km southeast of Halifax. Project planning is well advanced; procurement of major project components began in 2008.

Table 4.5: Sable Offshore Energy Expenditures and Employment, 2002-2006[1]

	Expenditures ($millions)		Gross Revenue ($ million)	Production Vol (M3)	Employment (Annual average head counts)
	Total	Nova Scotia			
2002	440	177	827	5,474,993	900
2003	543	209	1,152	4,665,769	974
2004	509	181	1,096	4,327,897	1,082
2005	413	136	1,518	4,225,762	733
2006	463	193	1,014	3,794,706	697

1. See Note 8

Oil and gas support services and supply

The offshore oil and gas industry relies heavily on a wide range of services to support exploration, development and extraction (production). These services include engineering and project management, fabrication and construction contracting, logistics (supply vessel and helicopter support), transshipment terminal operations, various oil field technical and environmental services, maintenance contracting, catering, insurance and professional services including legal and accounting.

Contractors and companies resident in Nova Scotia supply many of these services, with most of them operating from facilities within the ESSIM Area boundary. Obtaining data on the size of the service industry is complicated because the industry does not conform to a standard classification for which data are compiled and reported.

Marine Transportation

The marine transportation sector is a key component of the Nova Scotia economy. The province's fine ports and strategic location on the main north Atlantic shipping route facilitate not only the development and growth of its natural resource base and manufacturing industry, but also the efficient movements of international cargoes to markets in central North America.

In 2005, ports within the ESSIM Area accounted for over 90% of total provincial vessel movements and cargo handled (Table 4.6). Halifax is the largest port in Nova Scotia in terms of vessel movements, with the most diverse cargo base and the most extensive hinterland. It handled 14.1 million tonnes of cargo in 2005. It is the largest short sea shipping port (a port that transships international and regional cargoes to smaller regional ports) in the country, the second largest cruise port in Canada after Vancouver, and the third largest container port in Canada. Other significant cargoes include gypsum, crude and refined oil as well as automobile imports and exports.

Port Hawkesbury, on the Strait of Canso, is the largest port by tonnage of cargo handled. Most of the volume is accounted for by the petroleum transshipment facility operated by Statia Terminals. Bulk exports of gypsum, paper products, aggregate and imports of coal make up the balance. In 2005, it handled 30.7 million tonnes of cargo, up by 27.9% from the previous few years due to an increase in international shipments of crude petroleum.

Table 4.6: Vessel Movement and Tonnes of Cargo, 2005[1]

	Domestic		International		Total	
	Vessel Movement	Tonnes of Cargo (000s)	Vessel Movement	Tonnes of Cargo (000s)	Vessel Movement	Tonnes of Cargo (000s)
Eastern Scotian Shelf LOMA	1,785	3,667	2,105	44,279	3,890.0	47,946

1. See Note 9

Ferry services in the ESSIM Area consist of various routes that meet the transportation needs of residents and non-residents. The sector is comprised of both regular and seasonal passenger/ vehicle/commercial transportation support operated by Marine Atlantic Inc.

Marine Atlantic is a federal Crown Corporation that provides ferry service between Nova Scotia and Newfoundland. The service consists of two routes Port aux Basques to North Sydney (operates year round) and Argentia to North Sydney (operates between June and September).

In 2006, the company carried about 405,000 passengers and 223,000 vehicles (Table 4.7). It employs 929 people, about one quarter of whom reside in Nova Scotia (the rest in Newfoundland and Labrador).

Table 4.7: Ferry Industry for the Eastern Scotian Shelf LOMA, 2006[1]

	Employment	Passengers	Vehicles
Ferry Industry	230	405,000	223,000

1. See Note 10

With the LOMA accounting for about 90% of freight traffic and 34% of ferry traffic, and freight generating greater economic activity, the overall weighting of marine transportation impacts is estimated at 85% of the provincial total.

Ocean-based tourism

Ocean tourism is broken down into three expenditure-driven areas: cruise ship activity, coastal tourism in the form of water-based recreational activities, and marine recreational fishing. These three activities are well defined and some attempt has been made to quantify their economic significance based on various reports and surveys. Overall, ocean tourism in the ESSIM Area accounts for an estimated $200 million in spending annually out of a provincial total of about $320 million.

Cruise ship activity in the ESSIM Area is a growing industry that generates approximately $30 million in expenditures (Table 4.8). The ports of Halifax and Sydney are the two most active cruise ship ports in the province attracting over 200,000 passengers from key markets in Canada, U.S. and Europe in 2007 (Table 4.9).

Table 4.8: Direct Cruise-related Expenditures for the Eastern Scotian Shelf LOMA, 2002-2007 ($ Millions) [1]

	2002	2003	2004	2005	2006	2007
ESSIM Area	41	41	49	41	34	30

1. See Note 11

Table 4.9: Cruise ships and passengers in Halifax and Sydney [1]

Year	Number of Ships		Number of Passengers (000s)	
	Halifax	Sydney	Halifax	Sydney
2002	87	40	157	55
2003	104	46	170	45
2004	122	60	211	61
2005	108	47	189	59
2006	86	36	170	47
2007	92	32	177	37

1. See Note 12

The 2000 and 2005 *Surveys of Recreational Fishing in Canada* indicate that expenditures by those engaged in saltwater fishing in Nova Scotia generate an estimated $20 Million in 2006. The ESSIM Area accounts for about 40% of the total (Table 4.10).

Table 4.10: Saltwater fishing expenditures for the ESSIM Area, 2002-2006 ($Millions) [1]

	2002	2003	2004	2005	2006
ESSIM Area	11	10	9	8	8

1. See Note 13

Coastal tourism includes ocean touring (whale watching, sightseeing, coastal hiking, diving and kayaking), as well as sailing, cruising and visiting beaches and other marine locations. Statistical agencies and departments of tourism in Canada do not systematically track and report demand and expenditures for these activities. Nonetheless, it is possible to develop an estimate of coastal tourism expenditures using various surveys and studies (see Appendix 2). These surveys identify specific marine activities and by linking average daily expenditures to days spent in these activities (based on survey results) within the LOMA, an aggregate expenditure level may be estimated.

Following this methodology, Table 4.11 reports that participation in coastal activities in the ESSIM Area generated an estimated $160 million in tourism expenditures (about 60% of the provincial total). It should be noted that this estimate includes expenditures by tourists and local residents.

Table 4.11: Coastal tourism expenditures for the ESSIM Area, 2002-2006 ($Millions) [1]

	2002	2003	2004	2005	2006
ESSIM Area	n.a.	n.a.	n.a.	n.a.	220

1. See Note 14

Marine construction

Marine construction does not conform to a NAICS industry for which data are readily available. This activity includes building wharves and breakwaters, as well as dredging operations. Work is conducted by port authorities and operating companies at major ports, and also by DFO, DND and local authorities at small craft harbours. Marine construction also includes installation (and outfitting) of production facilities and sub-sea systems for the offshore oil and gas industry. It also includes submarine cables, though the latter were not considered in this study.

For the ESSIM Area as a whole, construction expenditures averaged about $154 million over the 2002-2006 period.

- **Ports** – Capital expenditures averaged just over $11 million (Table 4.12).
- **Small Craft Harbours program** – The program is comprised of just under 200 fishing harbours throughout the province, with 24% located within the ESSIM Area. Based on this proportion, capital expenditures over the period are estimated at about $2.1 million. (Table 4.12).
- **National Defence** – upgrading of facilities at CFB Halifax and Shearwater.
- **Oil & Gas** – development of facilities in the field.

Table 4.12: Ports & harbours capital expenditures in the ESSIM Area, 2002-2006 avg.

	Capital Expenditures ($ Millions)
Port of Halifax[1]	11.3
Small Craft Harbours[2]	2.1
National Defence[3]	45.0
Oil & Gas[4]	95.2
Total	153.6

1. See Note 15
2. See Note 16
3. See Note 17
4. See Note 18

Future marine construction in the ESSIM Area could include proposed container terminals at Sydport in Sydney, and at Melford Point on the Strait of Canso. A petrochemical plant and liquefied (LNG) facility for Goldboro, Nova Scotia has also been proposed. This project has recently received environmental approvals from both provincial and federal officials.

Shipbuilding and boat building

The ship and boat building industry in Nova Scotia is comprised of two shipyards within the ESSIM Area (Halifax) and 40-60 boat-builders scattered around the province. Industry Canada data shows that as recently as 2006, the industry generated revenues in the $202 million range (Table 4.13), of which half is estimated to have originated in the ESSIM Area.

Table 4.13: Ship & boat Building industry for the ESSIM Area, 2002-2006[1]

	2002	2003	2004	2005	2006
Number of companies	89	-	67	-	32
Revenues ($Million)	208	92	118	72	101

1. See Note 19

Due to the insufficient data on navigation and guidance equipment, this report captures only the impact of the ship and boat building sector.

Government services

Federal and provincial governments within the ESSIM Area play a vital role in the protection and management of the marine environment. They contribute to the value of the ocean sector in a number of ways: direct employment; spending on capital, operations and maintenance, research and development; and, in the support of initiatives in the non-profit and not-for-profit sectors.

Since ESSIM-specific employment and expenditures are not available, estimates were obtained by proportioning various industry-specific allocation factors to aggregate provincial amounts. Overall, governmental services generated approximately $493 million in expenditures and created over 5,800 full-time equivalent jobs in 2006 (Table 4.14). See Appendix 2, Table A2-1 for details on allocation factors.

Table 4.14: ESSIM expenditure and employment of major Federal and Provincial Departments, 2006

Governments	Employment (FTE)	Expenditures ($ Million)
Federal[1]	5,670	474
Provincial[2]	162	19
Total	5,832	493

1. See Note 20
2. See Note 21

Universities and ENGOs

Dalhousie University and some of its affiliated institutes offer programs and conduct research in the marine area. National and local Environmental NGOs also pursue marine programs. Estimates of program and research expenditures are available at the provincial level, though reliable estimates of activity and spending within ESSIM are not available. In the absence of this detail, given the location of the Dalhousie campus and research facilities and the offices of ENGOs (adjacent to the LOMA), and given the relative significance of marine activities along the Scotian Shelf, we notionally allocate 25% of marine expenditures to ESSIM.

4. Interactions

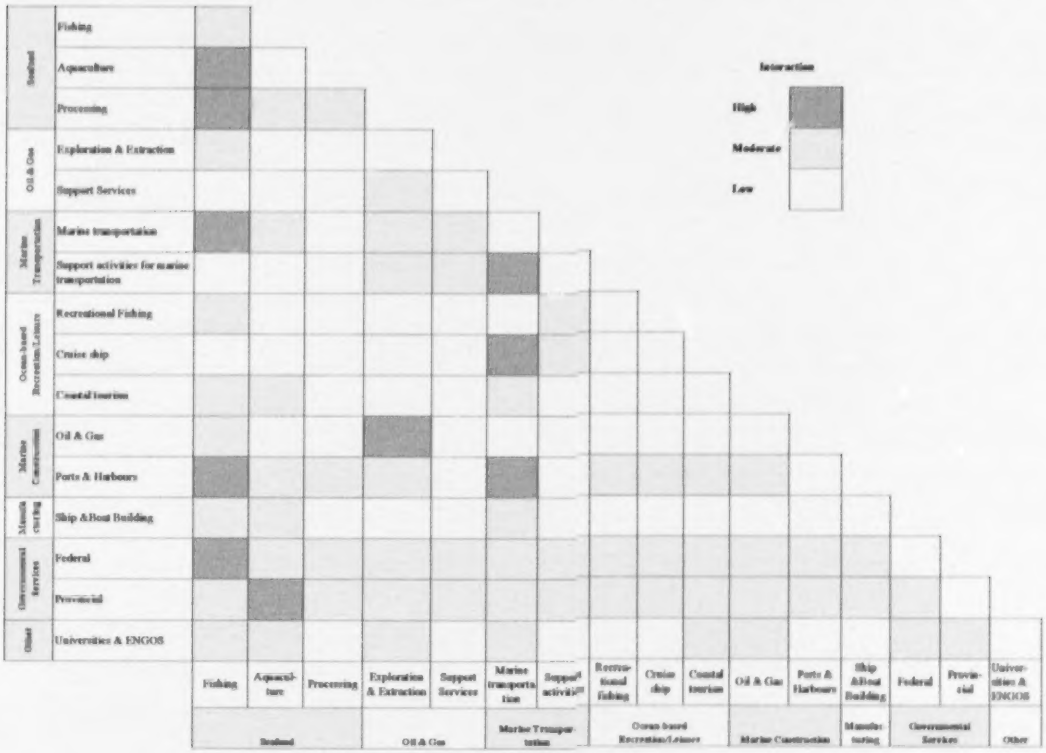
This high-level discussion of interactions is qualitative in nature. The interactions focus on the existence of economic interdependence (negative or positive) between or among activities. Many negative interactions between and amongst activities are low to moderate, reflecting in part the physical separation of most activities. Where there had been conflicts, these have been resolved or minimized over the years, either through the cooperation of the interests or through policy and regulation. Some activities are positively linked, with one activity reinforcing or building on another. Interactions are summarized in the matrix below, with relative intensity indicated by shading (white=weak; black=strong). Among the highlights:

- **Fishing** – There is overlap in the optimal timing of the crab and lobster fisheries, with some disagreement over which should take precedence. The strong interaction with fish processing reflects the mutual dependence of the industries. Competition for marine space is minimal with oil & gas, since the latter covers a relatively small part of the Scotian Shelf and does not occur in an area of major fishing activity. Fishing depends heavily on water transportation to

ship product, but also competes for ocean space where shipping lanes run through fishing grounds (e.g., entrance to Halifax Harbour/Strait of Canso). The fishery depends heavily on small craft harbours for berthing and facilities to unload and load vessels. The fishery provides an important market for the boatbuilding industry. A strong interaction with the federal government arises from the Fisheries and Oceans Canada mandate for fisheries management.

- **Aquaculture** – competition with the lobster fisheries for ocean space as well as perceived risk to environmental health continue to create controversy and limit access to suitable sites for both finfish and shellfish. Conflicts have also emerged with coastal landowners over aesthetics (cottage-owners contend that aquaculture gear compromises oceans views) and concerns over environmental damage. Aquaculture provides a small market for the boatbuilding industry. A strong interaction with the provincial government arises from the Fisheries and Aquaculture mandate for licensing and regulation.
- **Processing** – there is a strong backward linkage to fishing, particularly the lobster, crab and groundfish fisheries, with a moderate linkage to aquaculture. The system of small craft harbours facilitates landing and trucking raw material from remote sites to processing plants. Water transportation is vital for importing some raw material and shipping finished product. A moderate interaction with the provincial government arises from the Fisheries and Aquaculture mandate for policy, licensing and regulation.
- **Oil & gas** – there is minimal spatial conflict with the fishery because activity occurs on the Scotian Shelf in areas where fishing effort has traditionally been light. The industry relies heavily on support activities provided by local companies including supply vessel/helicopter logistics. The federal and provincial governments share regulatory responsibility through the Canada-Nova Scotia Offshore Petroleum Board.
- **Marine transportation** – depends strongly on port infrastructure and facilities, as well as support activities such as cargo handling and navigational services. Tourism benefits from inter-provincial as well as coastal ferry services. Federal and provincial governments provide regulatory oversight, and also provide financial support for ferry services.
- **Ocean based recreation and leisure** – good port and harbour facilities are integral to all three components – recreational fishing, cruise ship and coastal tourism (e.g, whale watching, sailing/boating, kayaking, etc.). Aquaculture gear (pens and head ropes) may present hazards to navigation for other marine users including fisheries, recreational fisheries and coastal tourism.
- **Oil & gas construction** – Pipelines construction interferes with fishing. Risks for on-going interference with fisheries arising from pipeline operation (vibration and noise) are under study. Slow moving barges laden with modules and equipment present minor hazards to navigation requiring advanced notice to mariners. Offshore construction areas posing hazards to shipping and fishing are addressed through exclusion zones.
- **Federal/provincial governments** – federal departments including Fisheries and Oceans Canada, Transport Canada and Environment Canada exercise regulatory authority over many ocean activities, with others covered by provincial departments including Fisheries and Aquaculture, Transportation and Infrastructure Renewal, and Tourism and Culture.

Economic Interdependence Matrix for the ESSIM Area



5. Current and future economic impacts

Ocean activity in the ESSIM Area contributed almost $2.4 billion in overall GDP to the Nova Scotia economy in 2006, creating about 29,000 jobs and generating about $1.3 billion in total income (Table 4.15).

- **Fishing** – the growth of shellfish resources has allowed the fisheries economy to regain (and even exceed) its former strength following the contraction in the early 1990s due to the collapse of groundfish stocks,. The resource (crab, lobster and scallop) is healthy, though fully utilized, providing limited basis for expansion. Growth in economic impact in the future is likely to be determined mainly by market conditions and exchange rates.
- **Aquaculture** – industry performance has been stable, though there have been challenges arising mainly from competitive conditions in major markets. Access to sites, particularly for finfish, continues to limit expansion. Mussel production is firmly established, but growth constrained by competition for market share from other producers in Atlantic Canada.
- **Processing** – Processors rely heavily on locally-caught raw material and have had to adjust to changing species mix and resource conditions. The industry has undergone a period of consolidation over the past several years as the once plentiful groundfish stocks have failed to recover and with production geared mainly to the fresh market. The future economic impact hinges mainly on markets and exchange rates.
- **Oil & gas extraction** – Not much development activity in this sector in the past decade, but the contribution to GDP increased substantially in the past few years with the increase in natural gas prices. One project is in production, with a second in the advanced planning stage. The sector has injected hundreds of millions of dollars into the provincial economy. The provincial treasury has benefited greatly from the increases in natural prices over the past two years, though the global recession will cause royalties to decline. What impact current prices will have on the prospects for future developments is less clear, though a recovery in demand and prices is expected as economies climb out of recession.
- **Marine transportation** – this sector has strong backward linkages to several provincial industries including fish processing, mining and forestry. The industry, particularly its container mode, also serves as a principal gateway into central Canada and the U.S. Bulk cargo and container traffic are likely to slow in the next year or two with the global recession, with bulk cargo recovering as the U.S. economy recovers. The long-term future of container traffic is less certain with major expansions in U.S. ports, and also as the economics of container shipping changes. Proposals for two new container terminals within the LOMA hinge on these developments.
- **Tourism** – This is a potential growth sector for the economy, with the expansion of adventure tourism and the evolution of the cruise ship industry.
- **Marine construction** – Activity levels are tied closely to offshore gas development, both with respect to the construction/installation of offshore platforms, and also the outfitting of topside facilities. Construction at ports and fishing harbours tends to be a fairly steady activity; proposed major projects could increase economic impact over the next few years.
- **Ship and boatbuilding** – This industry relies on ship repair/maintenance at a Halifax shipyard, and is also tied to the demand for fishing vessels (with a minor component aimed at pleasure craft). Demand is expected to slow in the next few years with deteriorating conditions in these markets.

Table 4.15: Economic impact of marine activities in the ESSIM Area, 2006

GDP and Income in $000s Employment in full-time equivalent	NS total output value	LOMA allocation	Direct			Indirect			Induced			Total		
Marine activity	$000s (1)	factor (2)	GDP	Employment	Income	GDP	Employment	Income	GDP	Employment	Income	GDP	Employment	Income
Commercial fishing	639,051	0.14	46,523	642	33,103	10,736	183	5,368	14,887	206	10,772	72,146	1,032	49,243
Aquaculture	35,000	0.07	1,054	18	515	490	5	245	401	6	213	1,945	28	972
Fish processing (3)	899,156	0.14	30,212	993	22,659	21,903	341	9,819	10,408	231	6,556	62,523	1,565	39,033
Oil & gas exploration/extraction	1,013,886	1.00	861,803	558	40,555	60,833	1,399	50,694	46,132	489	25,550	968,768	2,446	116,800
Support activities for oil & gas	0	1.00												
Water transportation	243,000	0.85	84,686	1,177	68,162	20,655	273	12,393	27,389	362	22,555	132,729	1,812	103,110
Support activities for transportation	281,000	0.85	128,979	3,170	112,260	47,770	418	16,720	45,955	897	36,114	222,704	4,484	165,093
Tourism & recreation	404,814	0.62	105,414	3,012	75,295	62,746	1,757	62,746	43,722	1,192	38,652	211,881	5,961	176,693
Oil & gas facilities construction	102,071	1.00	51,036	333	24,497	30,621	167	6,124	21,231	125	8,574	102,888	625	39,195
Ports and harbours construction	76,824	0.80	24,584	369	15,979	12,292	553	19,667	9,588	230	9,981	46,463	1,152	45,627
Ship and boat building	202,000	0.50	37,000	595	23,680	8,880	149	5,180	11,929	186	8,081	57,809	930	36,941
National Defence	863,800	0.50	306,649	5,350	306,649	60,466	1,261	47,509	95,450	1,653	99,164	462,565	8,264	453,322
Fisheries & Oceans	243,379	0.14	17,037	261	17,037	9,540	42	2,385	6,910	76	5,438	33,487	378	24,860
Other federal departments	29,440	0.31	6,388	57	6,388	1,369	28	821	2,017	21	1,201	9,774	106	8,411
Provincial departments	26,224	0.55	10,096	80	10,096	2,163	98	2,596	3,188	44	1,656	15,447	222	14,348
Universities & ENGOs	22,100	0.25	2,343	32	1,815	495	9	231	738	10	573	3,576	51	2,619
Total	4,442,694		1,713,802	16,646	758,690	350,961	6,682	242,499	339,943	5,730	275,079	2,404,705	29,058	1,276,267

1. See Gardner Pinfold, *Economic Impact of Marine Related Activities in Canada*, 2009, (prepared for DFO) for sources and derivation of output values.
2. See Appendices 1 and 2 for derivation of allocation factors.
3. Fish processing impacts have been adjusted to remove double counting of indirect and induced impacts of commercial fishing.

V

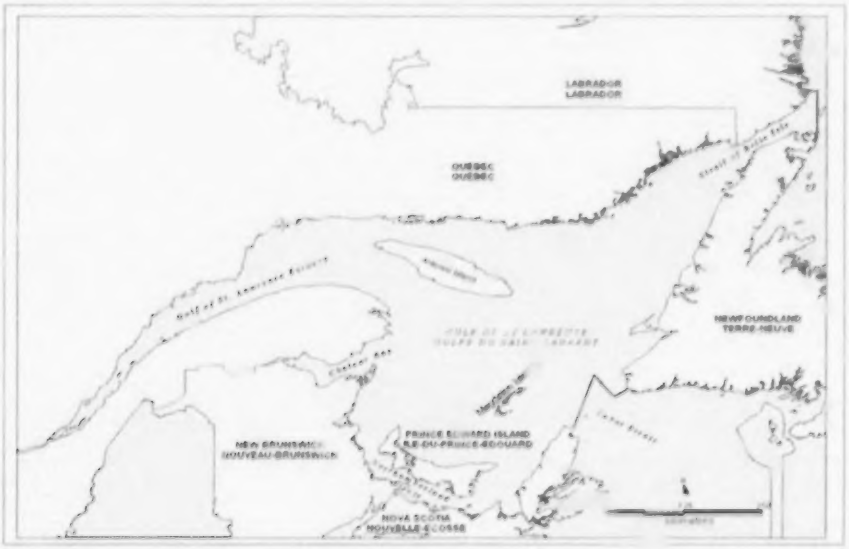
GULF OF ST. LAWRENCE LARGE OCEAN MANAGEMENT AREA

1. The area

The Gulf of St. Lawrence is one of five priority Large Ocean Management Areas (LOMAs) identified under the Ocean Action Plan for integrated management planning. The LOMA (Figure 1), covers an area of about 200,000 sq. km, encompassing both the Gulf of St. Lawrence and the marine estuary of the St. Lawrence River (Figure 5.1).

Bordering the four Atlantic Provinces and Québec, this unique ecosystem not only supports many aquatic and non-aquatic species, but also forms the basis for economic activity in key industries such as fishing, aquaculture, marine transportation and tourism. These activities generate substantial employment and income, making major contributions to the economic health of the provinces and sustaining many adjacent coastal communities.

Figure 5.1: Gulf of St. Lawrence Large Ocean Management Area



Source: DFO

2. Methodology

This report provides an overview of the range of human activities occurring in the Gulf LOMA, and quantifies these activities using various industry-specific indicators. The report extends this analysis by providing an estimate of the economic impact of these activities in terms of their contribution to gross domestic product, employment and household income. The report also provides an overview of the interactions between and among the various activities.

Estimating the economic impact of ocean activities for the Gulf LOMA is carried out in three steps.

- First, DFO planning documents providing an overview of the nature and extent of human activities are reviewed and synthesized.*
- Second, for each of the activities, industry and economic data are compiled or estimated from statistical sources and government departments. The challenge in this step is to ensure on the one hand that the data capture only activities occurring within the LOMA boundary, and on the other hand ensuring the data accurately reflect the extent of each activity. Unless otherwise indicated in the text, activities are quantified using a bottom-up approach based on location-specific data. For example, the estimate of the economic significance of the fisheries is based on catch and effort data by fishery for statistical areas within the LOMA. Similarly, estimates for ports and shipping are based on port-specific cargo levels and vessel movements.
- Third, a top-down approach is used to estimate the economic impact (GDP, employment, household income) of LOMA activities. This approach starts with provincial impacts and assigns or distributes them to the LOMA using an indicator linking activity and location (e.g., share of landings in the case of fisheries, or share of cargo tonnages in the case of shipping). More detail on the methodology for estimating impacts may be found in Chapter II.

3. Human activity

Fishing

Commercial fishing activity in the Gulf represents a major contributor to the adjacent provincial economies. It is comprised of a diversity of resources including shellfish (i.e. lobster, crab and shrimp), groundfish (i.e., cod, Greenland turbot and American Plaice), pelagic (i.e. herring mackerel, tuna) and other smaller marine fisheries (i.e. marine plants and seals). Between 2002 and 2007 total commercial landed values averaged about $550 million (Table 5.1). This is about 29% of the combined landings of the five provinces. The rise and fall in landed value shown in Table 5.1 is attributable mainly to swings in crab landings and markets, with the decline in the value of the U.S. dollar also playing a significant role after 2004.

*Alexander, D.W., Sooley, D.R., Mullins, C.C., Chiasson, M.I., Cabana, A.M., Klvana, I., and Brennan, J.A., 2008. Gulf of St. Lawrence: *Human Systems Overview Report*: xiv + 166 p. (unpublished); DFO, *The Gulf of St. Lawrence - A Unique Ecosystem*: http://www.glf.dfo-mpo.gc.ca/os/goslim-gigsl/index-e.php; Blanchard, K.A., and Wall, R.J., *Social, Economic and Cultural Overview of Western Newfoundland and Southern Labrador*, Prepared for, Fisheries and Oceans Canada, Newfoundland and Labrador Region, August 2008.

Table 5.1: Commercial landings and landed value from the Gulf LOMA, 2002-2007 [1]

Landings	2002	2003	2004	2005	2006	2007
Tonnes	227,000	213,000	219,000	249,000	241,000	232,000
Values ($000)	584,000	558,000	610,000	564,000	461,000	533,000

1. See Note 1

The groundfish moratoria on cod and redfish in the early 1990s, led to the shut-down of many businesses and the loss of thousands of jobs. As fishing economies reduced in size, other fisheries like shellfish (especially lobster, crab and shrimp) began to emerge and now account for over 85% of total landed value.

In 2007, fisheries within the LOMA provided employment for an estimated 13,000 fishers operating from 4,600 fishing vessels (Table 5.2).

Table 5.2: Employment and active fishing vessels in the Gulf LOMA, 2007

	Employment[1]	Number of Active Vessels[2]
Fishing	**13,000**	**4,600**

1. See Note 2
2. See Note 3

Aquaculture

Aquaculture in the LOMA accounts for approximately $39 million in production value (about 9% of total output value of the five provinces). It is comprised of about 1,700 sites, distributed throughout the Gulf of St. Lawrence, with the majority of sites located in PEI and New Brunswick. These two provinces account for over 95% of total production in the Gulf, with shellfish being the dominant species (i.e., blue mussels and oyster).

In the past decade, the industry has experienced relatively rapid growth due to a variety of factors including an increase in global demand, advances in technology and declines in a number of commercial fisheries. Overall the industry produced approximately 22,000 tonnes of mostly shellfish, and employed approximately 1,000 in production activities in 2006 (Table 5.3).

Table 5.3: Aquaculture activity for the Gulf LOMA, 2006 [1]

	Employment	Number of Sites	Value ($000)
Aquaculture	**1,000**	**1,700**	**39,000**

1. See Note 4

Fish processing

The fish processing industry in the Gulf consists of 214 plants, ranging widely in processing capacity, species used, product form and value, and employment (Table 5.4).

The industry has endured significant changes since the collapse of groundfish stocks in the early 1990s. It forced many processing plants to close down, negatively impacting the economic viability of many coastal communities. Despite the downturn, several processing plants have continued to operate through customization of their facilities to process lobster, crab and shrimp.

In 2006, the 214 fish processing plants in the Gulf generated an estimated $938 million in output value (29% of total Atlantic region production, based on value of landings within the LOMA), employing around 11,000 in production activities (Table 5.5).*

Table 5.4: Number of fish processing plants in the Gulf LOMA, 2006 [1]

Province	Number of Fish Processing plants
Newfoundland & Labrador	20
Quebec	72
New Brunswick	68
Nova Scotia	16
Prince Edward Island	38[1]
Total	**214**

1. See Note 5

Table 5.5: Fish processing activity in the Gulf LOMA, 2006

	Employment[1]	Production ($ Millions)[2]
Fish Processing	**11,000**	**938**

1. See Note 6
2. See Note 7

Oil & Gas exploration and extraction

The oil and gas industry in the Gulf continues to be at its infancy stage and has yet to produce any significant discoveries to the magnitude of those of the Atlantic offshore. Activities in the area are primarily comprised of seismic operations and onshore drilling, with few drilled offshore wells.

Offshore and inshore exploration activity is expected to rise due to a variety of factors including high oil prices, projected downturns in the supply of high grade oil and gas from western Canada, and the signing of new revenue-sharing agreements between the government of Canada and the province of Newfoundland and Labrador.

Marine Transportation

The marine transportation industry in the Gulf LOMA plays a major economic and socio-economic function that contributes to five provincial economies. Its adjacent ports generate significant marine traffic that not only provide support to commercial activities related to domestic and international trade, but also sustain many resource-based industries like fishing, mining, forestry and agriculture.

In 2005, ports surrounding the Gulf experienced approximately 3,200 vessel movements and handled about 61 million tonnes of cargo (Table 5.6). The Quebec ports of Sept-Îles/Pointe-Noire and Port-Cartier experienced the highest level of vessel activity in the area due to mainly the cargo handling of Iron ores and concentrates. The ports ranked 7th and 9th respectively in overall cargo handled in Canada.

* Because the allocation factor is applied to the total value of regional output, the estimate of LOMA impact includes some of the output value associated with the several thousand tonnes of lobster imported annually from Maine for processing and re-export. Data limitations make it difficult to estimate this value with confidence.

It should be noted Québec City and Montreal lie outside the boundary of the Gulf LOMA.

Table 5.6: Vessel movement and tonnes of cargo for the Gulf LOMA, 2005 [1]

	Domestic		International		Total	
	Vessel Movement	Tonnes of Cargo (000s)	Vessel Movement	Tonnes of Cargo (000s)	Vessel Movement	Tonnes of Cargo (000s)
Gulf LOMA	**2,000**	**17,000**	**1,200**	**44,000**	**3,200**	**61,000**

1. See Note 8

Ferry services in the Gulf LOMA consist of various routes that meet the transportation needs of residents and non-residents. These services are comprised of both regular and seasonal passenger/vehicle/commercial transportation support operated by public and private organizations including the Northumberland Ferries, CTMA Group, La Société des Traversiers du Québec, Le Traversier Rivière du Loup St. Simeon Ltée., and the government of Newfoundland and Labrador. These organizations provide ferry services to several major routes including: Caribou (NS) to Wood Islands (PEI); Cap aux Meules (QC) Magdalen Islands (QC) and Souris (PEI); Blanc Sablon (NL) and St. Barbe (NL) and other various routes within Québec.

In 2006, Ferry services in the area carried approximately 6 million passengers, 3 million vehicles and employed 1,000 people (Table 5.7).

Table 5.7: Ferry Industry for the Gulf LOMA, 2006 [1]

	Employment	Passengers (000s)	Vehicles (000s)
Ferry Industry	1,000	6,000	3,000

1. See Note 9

Ocean-based tourism

Ocean tourism is broken down into three expenditure-driven areas: cruise ship activity, coastal tourism in the form of water-based recreational activities, and marine recreational fishing. These three activities are well defined and some attempt has been made to quantify their economic significance based on various reports and surveys. Overall, ocean tourism generates an estimated $570 million in spending annually in the Gulf LOMA.

Cruise ship activity in the Gulf LOMA is a growing industry comprised of primarily two markets Canada/New England and Europe. In 2006, the industry generated 149,000 individual passenger and crew onshore visits, producing expenditures of about $57 million (Table 5.8).

Table 5.8: Direct Cruise-related Expenditures, 2002-2007 ($ Millions) [1]

	2002	2003	2004	2005	2006	2007
Gulf LOMA	61	57	71	59	57	56

1. See Note 10

The 2000 and 2005 *Surveys of Recreational Fishing in Canada* indicates that expenditures by those engaged in saltwater fishing in the Gulf LOMA reached an estimated $65 Million in 2006 (Table 5.9).

Table 5.9: Saltwater fishing expenditures for the Gulf LOMA, 2002-2006 ($Millions) [1]

	2002	2003	2004	2005	2006
Gulf LOMA	89	83	77	73	65

1. See Note 11

Coastal tourism includes ocean touring (whale watching, sightseeing, coastal hiking, diving and kayaking), as well as sailing, cruising and visiting beaches and other marine locations. Statistical agencies and departments of tourism in Canada do not systematically track and report demand and expenditures for these activities. Nonetheless, it is possible to develop an estimate of coastal tourism expenditures using various surveys and studies (see Appendix 2). These surveys identify specific marine activities and by linking average daily expenditures to days spent in these activities (based on survey results) within the LOMA, an aggregate expenditure level may be estimated.

Following this methodology, Table 5.10 reports that participation in coastal activities in the LOMA generated an estimated $722 million in tourism expenditures. It should be noted that this estimate includes expenditures by tourists and local residents in the area.

Table 5.10: Coastal tourism expenditures for the Gulf LOMA, 2002-2006 ($Millions) [1]

	2002	2003	2004	2005	2006
Gulf LOMA	n.a.	n.a.	n.a.	n.a.	722

1. See Note 12

Marine construction

Marine construction does not conform to a NAICS industry for which data are readily available. This activity includes building wharves and breakwaters, as well as dredging operations. Work is conducted by port authorities and operating companies at major ports, and also by DFO and local authorities at small craft harbours. For the Gulf LOMA, construction expenditures averaged $12.1 million over the 2002 – 2006 period (9% of the regional total).

- **Ports** – Major ports adjacent to GOSLIM reported capital expenditure averaging $11 million over the period (Table 5.11).

- **Small Craft Harbours program** – The program is comprised of about 800 fishing harbours in all five provinces. Capital expenditures in 2006 are estimated at about $9 million (Table 5.11).

Table 5.11: Ports & harbours capital expenditures for the Gulf LOMA, 2006

	Capital Expenditures ($ Millions)
Major Ports in LOMA[1] (2002-2006)	5.5
Small Craft Harbours[2] (2006)	6.6
Total	12.1

1. See Note 13
2. See Note 14

Marine construction also includes installation (and outfitting) of production facilities and sub-sea systems for the offshore oil and gas industry. Since the oil and gas sector has yet to produce any significant discoveries to the magnitude of those of the Atlantic offshore, little or no data is available for this category.

TransCanada and Petro-Canada have proposed the construction of a liquefield natural gas (LNG) terminal northeast of Quebec City in Gros Cacouna. This initiative would consist of a methane terminal, a liquefield natural gas plant and a pipeline. The construction of the terminal has been estimated to cost approximately $660 million and would generate nearly $240 million for the province of Quebec, with close to $135 million for the lower St-Lawrence region. It would also create nearly 3,700 direct and indirect jobs in Quebec and some 2,700 in the lower St-Lawrence. The terminal is scheduled to be operational in late 2009, although this date has been delayed due to market uncertainties and the challenges involved in securing LNG supply.

Shipbuilding and boat building

The ship and boat building industry in the five adjacent provinces is comprised of one large shipyard within the LOMA (Les Méchins, Quebec) and 200 - 250 boat-builders scattered throughout the provinces. Industry Canada data shows that in 2006, the industry in the five provinces generated revenues in the $620 million range, of which just over half was generated by yards in the LOMA (Table 5.12).

Table 5.12: Ship & boat building industry for NS, NB, PEI, QC and NL, 2002-2006[1]

	2002	2003	2004	2005	2006
Number of companies	-	-	500	271	252
Revenues ($Million)	758	607	675	498	620

1. See Note 15

Due to the insufficient data on navigation and guidance equipment, this report captures only the impact of the ship and boat building sector.

Government services

Twelve federal departments, numerous federal agencies and five provincial governments play an active role in the protection and management of the marine environment. They contribute to the value of the ocean sector in a number of ways: direct employment, capital spending, operations and maintenance spending, spending on research and development, and in the support of initiatives in the non-profit and not-for-profit sectors.

Since LOMA-specific employment and expenditures are not available, estimates were obtained by proportioning various industry-specific allocation factors to aggregate provincial amounts. Overall, governmental services generated approximately $300 million in expenditures and 2,640 full-time equivalent jobs in 2006 (Table 5.13). See Appendix 2, Table A2-1 for details on allocation factors.

Table 5.13: Expenditure and employment of major Federal and Provincial Departments, 2006

Governments	Employment (FTE)	Expenditures ($ Million)
Federal[1]	2,490	277
Provincial[2]	150	23
Total	2,640	300

Source: Based on data provided by federal and provincial departments including annual financial reports.
1. See Note 16
2. See Note 17

Universities and ENGOs

Québec-based universities, Memorial and Dalhousie Universities and their affiliated institutes offer programs and conduct research in the Gulf of St. Lawrence. National and local Environmental NGOs also pursue marine programs in the Gulf. Estimates of program and research expenditures are available at the provincial level, though reliable estimates of activity and spending within GOSLIM are not available. In the absence of this detail, given the location of the universities and research facilities and the offices of ENGOs, and given the relative significance of marine activities within the Gulf, we notionally allocate 25% of regional marine expenditures to GOSLIM.

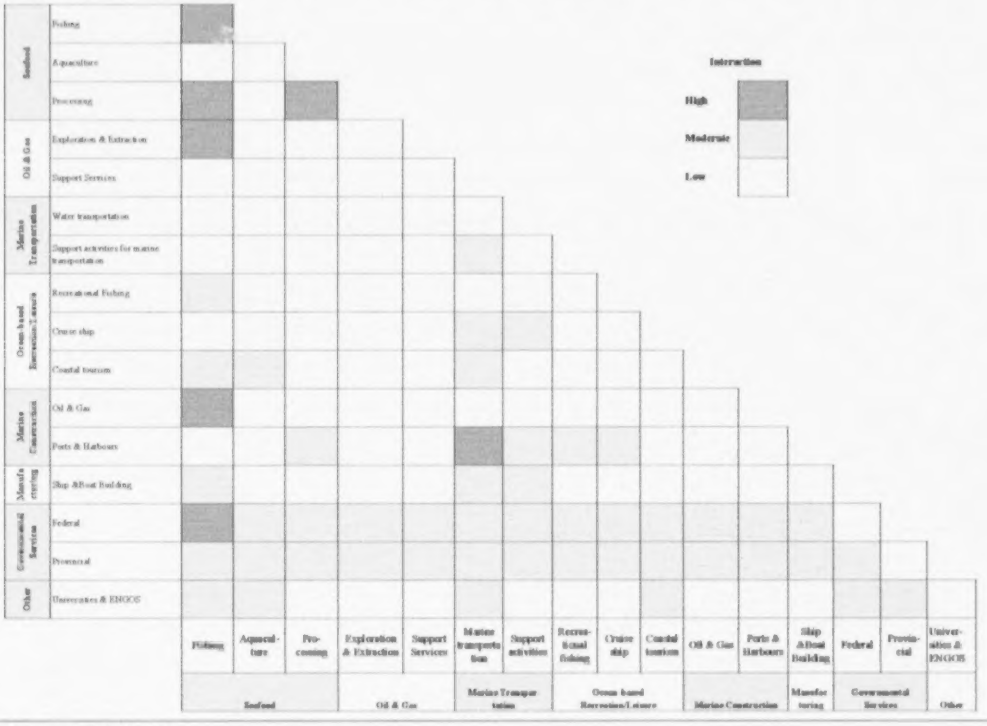
4. Interactions

This high-level discussion of interactions is qualitative in nature. The interactions focus on the existence of economic interdependence (negative or positive) between or among activities. Many negative interactions between and amongst activities are low to moderate, reflecting in part the physical separation of most activities. Where there had been conflicts, these have been resolved or minimized over the years, either through the cooperation of the interests or through policy and regulation. Some activities are positively linked, with one activity reinforcing or building on another. Interactions are summarized in the matrix below, with relative intensity indicated by shading (white=weak; black=strong). Among the highlights:

- **Fishing** – Though the seasons are fairly settled, there continues to be disagreement in some areas on the optimal timing of the crab and lobster fisheries. Also, there is internal disagreement on access and allocation in the crab fishery, particularly in Area 12. Access and allocation issues also affect the herring fishery off the south coast of PEI. The strong interaction with fish processing reflects the mutual dependence of the industries. The fishery depends heavily on small craft harbours for berthing and facilities to unload and load vessels. The fishery provides an important market for the boatbuilding industry. A strong interaction with the federal government arises from the Fisheries and Oceans Canada mandate for fisheries management.
- **Aquaculture** – this industry in the LOMA is small, focusing on two species: mussel and oyster. There is limited competition with the commercial fisheries for ocean space and little concern over environmental issues (unlike salmon and other finfish species). Aquaculture provides a small market for the boatbuilding industry. A moderate interaction with the provincial government arises from the Fisheries and Aquaculture mandate for licensing and regulation.

- **Processing** – there are well developed backward linkages to fishing, particularly the lobster, crab and shrimp fisheries. As well, there is a strong economic interaction amongst processors arising from the competition for raw material. The system of small craft harbours facilitates landing and trucking raw material from remote sites to processing plants. A strong interaction with the provincial government arises from the Fisheries and Aquaculture mandate for policy, licensing and regulation.
- **Oil & gas** – the high interaction between the oil & gas and fishing industries arises from conflict over seismic exploration in the southern Gulf of St. Lawrence. Fishers believe seismic activity has an adverse impact on the crab and lobster populations. The issue remains unresolved, thereby blocking any oil & gas activity in the LOMA.
- **Marine transportation** – depends strongly on port infrastructure and facilities, as well as support activities such as cargo handling and navigational services. Tourism benefits from inter-provincial as well as coastal ferry services. Federal and provincial governments provide regulatory oversight, and also provide financial support for ferry services.
- **Ocean based recreation and leisure** – good port and harbour facilities are integral to all three components – recreational fishing, cruise ship and coastal tourism (e.g., whale watching, sailing/boating, kayaking, etc.). Aquaculture gear presents minimal hazard to navigation.
- **Oil & gas construction** – No oil & gas activity has occurred.
- **Federal/provincial governments** – federal departments including Fisheries and Oceans Canada, Transport Canada and Environment Canada exercise regulatory authority over many ocean activities, with others covered by various provincial departments in the five provinces bordering the LOMA.

Economic Interdependence Matrix for the Gulf LOMA



5. Current and future economic impacts

Ocean activity in the LOMA contributes $2.7 billion in GDP to the economies of the adjacent provinces, creating almost 52,300 jobs and generating about $2.0 billion in total income (Table 5.14).

- **Fishing** – the growth of shellfish resources has allowed the fisheries economy to regain (and even exceed) its former strength following the contraction in the early 1990s due to the collapse of groundfish stocks. With the exception of crab, shellfish resources have been stable over the past several years and are fully utilized. Crab is currently in a cyclical downturn, but is expected to recover over the next few years. Growth in economic impact in the future is likely to be determined mainly by market conditions and exchange rates.
- **Aquaculture** – Industry performance has been stable, though there have been challenges arising mainly from competition for market share among producers in the region. Most of the suitable habitat is in use, so the sector, dominated by mussel and oyster, is likely to grow slowly.
- **Processing** – The sector is dominated by lobster and crab, with processors relying heavily on local raw material as well as imports from other parts of Atlantic Canada and Maine. The industry has undergone a period of consolidation over the past several years as rising raw material costs have driven all but the most efficient out of the industry. With stable raw material supply, the future economic impact hinges mainly on markets and exchange rates.
- **Oil & gas exploration/extraction** – The fishing industry has successfully blocked exploration (seismic testing) in nearshore areas. No exploration programs are planned.
- **Marine transportation** – Bulk cargo and passenger ferries account for most of the marine traffic in the region, with minor levels of container shipping. Container and bulk cargo vessels traverse the LOMA heading to and from ports along the St. Lawrence, though economic impact of this traffic is not counted as part of the LOMA total.
- **Tourism** – This is a potential growth sector for the economy, with the expansion of the cruise ship industry.
- **Marine construction** – Activity levels are tied closely to repair and construction of fishing harbours. This tends to be a fairly steady activity.
- **Ship and boatbuilding** – The fortunes of this industry are tied in part to the demand for fishing vessels (with a minor component aimed at pleasure craft), and in part to ship construction and repair. Demand is expected to slow in the next few years with deteriorating conditions in these markets.

Table 5.14: Economic impact of marine activities in the GOSLIM area

GDP and Income in $000s Employment in full-time equivalent	Atlantic region output value	LOMA allocation factor (2)	Direct			Indirect			Induced			Total		
Ocean activity	$000s (1)		GDP	Employment	Income	GDP	Employment	Income	GDP	Employment	Income	GDP	Employment	Income
Commercial fishing	1,501,372	0.29	228,042	2,790	156,771	49,261	800	25,470	68,519	902	50,282	345,822	4,491	232,523
Aquaculture	467,565	0.09	15,624	226	6,349	6,878	107	3,448	5,247	86	2,701	27,748	420	12,498
Fish processing (3)	3,234,566	0.29	206,670	5,396	152,764	138,956	2,003	50,699	64,599	1,310	40,338	410,225	8,708	243,801
Oil & gas exploration/extraction	9,121,886	0.00												
Support activities for oil & gas	186,000	0.00												
Water transportation	872,600	0.30	105,552	1,544	81,699	34,523	591	23,375	39,404	609	32,535	179,479	2,744	137,609
Support activities for transportation	1,003,000	0.30	160,488	3,042	124,149	70,818	873	30,327	66,524	1,117	47,371	297,830	5,032	201,847
Tourism & recreation	1,590,981	0.55	390,590	10,201	268,450	262,015	6,382	234,754	185,013	4,897	156,865	837,618	21,480	660,068
Oil & gas facilities construction	267,785	0.00												
Ports and harbours construction	134,422	0.12	6,452	95	4,194	3,226	111	4,011	2,659	56	2,432	12,337	262	10,637
Ship and boat building	620,000	0.41	108,777	2,708	112,779	33,128	948	31,755	41,216	1,178	48,997	183,121	4,834	193,530
National Defence (4)	1,035,300	0.00												
Fisheries & Oceans (4)	694,072	0.38	168,761	2,423	168,761	78,642	417	24,294	71,182	838	60,453	318,585	3,679	253,508
Other federal departments (4)	74,600	0.14	6,943	68	6,943	1,442	31	1,186	2,075	28	1,929	10,460	127	10,058
Provincial departments	94,080	0.24	11,781	104	11,781	2,598	86	2,776	3,485	48	1,999	17,864	238	16,556
Universities & ENGOs	73,991	0.25	13,191	194	10,462	2,664	42	1,120	3,809	55	3,098	19,664	291	14,680
Total	19,470,848		1,422,871	28,790	1,105,102	684,151	12,390	433,213	553,732	11,125	449,000	2,660,754	52,305	1,987,315

1. See Gardner Pinfold, *Economic Impact of Marine Related Activities in Canada*, 2009, (prepared for DFO) for sources and derivation of output values.
2. See Appendices 1 and 2 for derivation of allocation factors.
3. Fish processing impacts have been adjusted to remove double counting of indirect and induced impacts of commercial fishing.
4. Includes only expenditures in provinces bordering the LOMA (Atlantic Provinces and Quebec).

VI

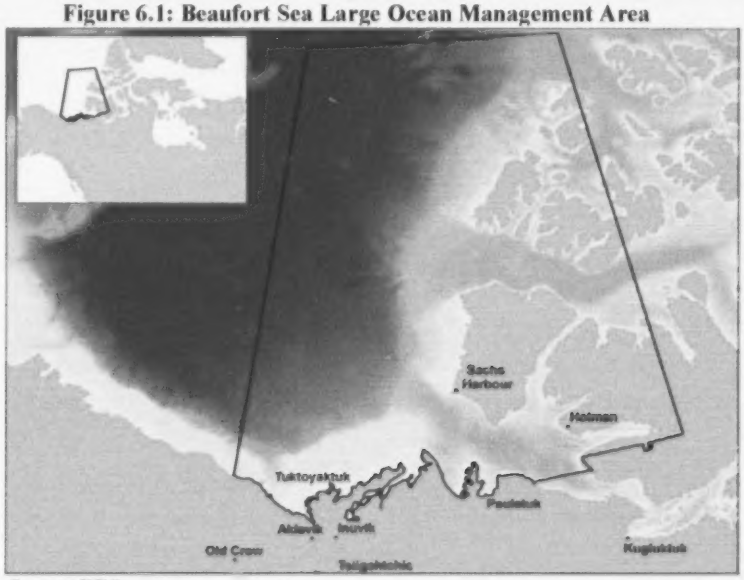
BEAUFORT SEA
LARGE OCEAN MANAGEMENT AREA ANALYSIS

1. The area

The Beaufort Sea initiative is one of the five priority Large Ocean Management Areas (LOMAs) identified under the Ocean Action Plan for integrated management planning. This area (Figure 6.1) is located in the marine portion of the Inuvialuit Settlement Region in the Canadian Western Arctic. It covers an area of approximately 1,750,000 square kilometres and includes the communities of Aklavik, Inuvik, Ulukhaktok (formerly Holman), Paulatuk, Sachs Harbour and Tuktoyaktuk.

This rich marine ecosystem supports various resource-based activities including subsistence fishing, oil and gas exploration and extraction, water transportation and tourism. These activities generate substantial employment and income, making major contributions to the economic health of the Territories and sustaining many adjacent coastal communities.

Figure 6.1: Beaufort Sea Large Ocean Management Area



Source: DFO

2. Methodology

This report provides an overview of the range of human activities occurring in the Beaufort Sea LOMA, and quantifies these activities using various industry-specific indicators. The report extends this analysis by providing an estimate of the economic impact of these activities in terms of their contribution to gross domestic product, employment and household income. The report also provides an overview of the interactions between and among the various activities.

Estimating the economic impact of ocean activities for the Beaufort Sea LOMA is carried out in three steps.

- First, DFO planning documents providing an overview of the nature and extent of human activities are reviewed and synthesized.*
- Second, for each of the activities, industry and economic data are compiled or estimated from statistical sources and government departments. The challenge in this step is to ensure on the one hand that the data capture only activities occurring within the LOMA boundary, and on the other hand that the data accurately reflect the extent of each activity. Unless otherwise indicated in the text, activities are quantified using a bottom-up approach based on location-specific data. For example, the estimate of the economic significance of the fisheries is based on catch and effort data by fishery for statistical areas within the LOMA. Similarly, estimates for ports and shipping are based on port-specific cargo levels and vessel movements.
- Third, a top-down approach is used to estimate the economic impact (GDP, employment, household income) of LOMA activities. This approach starts with provincial impacts and assigns or distributes them to the LOMA using an indicator linking activity and location (e.g., share of landings in the case of fisheries, or share of cargo tonnages in the case of shipping).

3. Human activity

Subsistence Fishing

Fishing activity in the Beaufort Sea LOMA is limited to a subsistence fishery that provides adjacent communities with a primary source of protein. It has a long history of economic, social and cultural importance in the area and for centuries has included the harvesting of a variety of whales, seals, polar bears and marine fish for consumption purposes. In spite of its significance to coastal communities, insufficient data limits the analysis of this sector.

The most recent attempt at estimating the economic value of this activity was provided by GSGislason & Associates Ltd., 2003. The report estimates that in the late 1990s, a total of 170 tonnes of edible weight of mammals and fish were harvested annually for subsistence use in the Northwest Territories. This is estimated to be worth approximately $3.4 million annually[2], based on a replacement cost of food protein in local food stores of $20 per kg. In addition to the value of the industry, the report also calculated that about 400 harvesters worked in the sector[3] (Table 6.1).

Cobb, D., et al, *Social, Cultural, and Economic Overview and Assessment Report for the Beaufort Sea LOMA, Beaufort Sea Large Ocean Management Area: Ecosystem Overview and Assessment Report;* GSGislason & Associates Ltd., and Outcrop Ltd., *The Marine-Related Economy of NWT and Nunavut*, Prepared for Fisheries and Oceans Canada Canada, Winnipeg, January 2003.

[2] These numbers exclude the value from the use of animal hides, bones, and other byproduct for clothing, arts and crafts etc.

[3] Most harvesters fish on a part-time basis.

Table 6.1: Annual Subsistence fishing activities from the Northwest Territories, late 1990s[1]

	Northwest Territories
Harvest (tonnes)	170
Value ($ millions)	3.4

1. See Note 1

Oil & Gas exploration and extraction

Oil and gas activity in the Beaufort Sea LOMA are mainly exploratory with no offshore producing oil or natural gas wells, with the exception of the Ikhil natural gas field (in the MacKenzie Delta). Developed in the late 1990s, Ikhil supplies the town of Inuvik with natural gas. Between 2002 and 2007, it extracted an average of 16 million m^3 of gas (Table 6.2).

Table 6.2: Ikhil Gas Field production of natural gas, 2002-2007[1]

	2002	2003	2004	2005	2006	2007
Production (millions of m3)	14.8	15.2	16.1	15.7	16.2	17.9

1. See Note 2

By the end of 2007, there were 11 active exploration licences in the LOMA, including the three exploration licences issued that year. These three licences covered an area of 417,217 hectares and totalled $598 million of work expenditure bids (over the next 9 years). Imperial Oil Resources Ventures Limited and ExxonMobil Canada Properties Limited accounted for the majority of work expenditures with a record bid of $585 million (Table 6.3).

Table 6.3: Exploration licences Beaufort Sea LOMA, 1999-2007[1]

	1999	2002	2004	2006	2007
Number of exploration licences issued	1	2	3	2	3
Area (ha)	73,155	384,976	148,577	156,561	417,217

1. See Note 3

Based on the Draft Beaufort Sea Social, Cultural and Economic Overview and Assessment Report, estimates were made on the total value of oil and gas in the grounds of the Mackenzie Delta and Beaufort Sea.

- **Oil** – gross value is approximately $26 billion to $64.1 billion (assumes an average 2000 oil price of $280/m3)
- **Natural gas** – gross value is approximately $20.5 billion to $38.5 billion (assumes an average 2000 natural gas price of $110/m3)

Marine Transportation

According to the 2005 Statistics Canada Shipping report, Western Arctic ports within the area such as Paulatuk, Tuktoyaktuk, Holman and Sachs Harbour handled an aggregate of about 24,000 tonnes of cargo (Table 6.4). The Northern Transportation Company conducts the majority of shipping activities in the area. Freight activity has been predicted to increase due to the growing oil and gas sector.

Table 6.4: Vessel Movement and Tonnes of Cargo, 2005[1]

	Domestic		International		Total	
	Vessel Movement	Tonnes of Cargo (000s)	Vessel Movement	Tonnes of Cargo (000s)	Vessel Movement	Tonnes of Cargo (000s)
Beaufort Sea	12	24.0	-	-	12	24.0

1. See Note 4

Ocean-based recreation/leisure

Ocean tourism is broken down into one expenditure-driven area: coastal tourism in the form of water-based recreational activities. This activity is well defined and some attempt has been made to quantify its economic significance based on various surveys. Overall, ocean tourism generates an estimated $470,000 in spending annually in the Beaufort Sea LOMA.

Coastal tourism includes ocean touring (whale watching, sightseeing, coastal hiking, diving and kayaking), as well as sailing, cruising and visiting beaches and other marine locations. Statistical agencies and departments of tourism in Canada do not systematically track and report demand and expenditures for these activities. Nonetheless, it is possible to develop an estimate of coastal tourism expenditures using various surveys and studies (see Appendix 2). These surveys identify specific marine activities and by linking average daily expenditures to days spent in these activities (based on survey results) within the LOMA, an aggregate expenditure level may be estimated.

Following this methodology, Table 6.5 reports that participation in coastal activities in the LOMA generated an estimated $470,000 in tourism expenditures. It should be noted that this estimate excludes expenditures by tourists residing outside Canada.

Table 6.5: Coastal tourism expenditures for the Beaufort Sea LOMA, 2006 ($000)[1]

	2002	2006
Beaufort Sea	460	470

1. See Note 5

Marine construction

The Mackenzie Gas Project involves construction of a 1,220 km natural gas pipeline system from the Beaufort Sea/Mackenzie Delta to Alberta, linking northern producing wells to southern markets. In 2007, construction costs were estimated at $16.2 billion. No date has yet been set to begin construction.

Government services

Federal and Territorial government departments and agencies in the Northwest and Yukon Territories play a key role in the protection and management of the marine environment. They contribute to the value of the ocean sector in a number of ways: direct employment, capital spending, operations and maintenance spending, spending on research and development, and in the support of initiatives in the non-profit and not-for-profit sectors.

Unfortunately, as LOMA-specific employment and expenditures are not available, only estimates for the NWT are provided. Overall, governmental services generated approximately $13.8 million in expenditures and 80 full-time equivalent jobs in 2006 (Table 6.6).

Table 6.6: Expenditure and employment of major federal and territorial departments, 2006

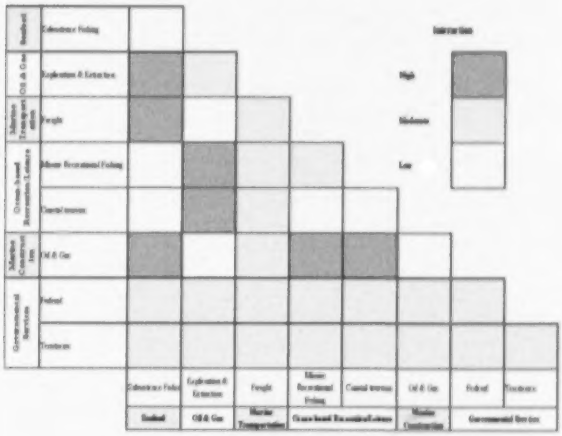
Governments	Employment (FTE)	Expenditures ($ Millions)
Federal[1]	50	12.5
Provincial[2]	30	1.3
Total	80	13.8

1. See Note 6
2. See Note 7

4. Interactions

- **Subsistence Fishing** – relies heavily on a healthy marine ecosystem that may be impacted by activities such as hydrocarbon exploration and related infrastructure and freight activity. As the level of these activities in the LOMA continues to grow, it poses environmental threats that could affect the marine ecosystem and hence subsistence fishing. Subsistence fishing activities are supported by the Inuvialuit Final Agreement and other land claim agreements.
- **Oil & gas** – the strong interaction between oil & gas and subsistence fishing arises from the environmental concerns about seismic exploration in the region. The proposed MPA in the Beaufort imposes limits to the oil and gas industry in order to protect and conserve beluga whales and their surrounding habitat.
- **Water transportation** – depends strongly on port infrastructure and facilities, as well as support activities such as cargo handling and navigational services. Future shipping activities are expected to rise as oil and gas activity in the north continues to grow.
- **Ocean based recreation and leisure** – good port and harbour facilities along with healthy and clean marine ecosystems are integral to coastal tourism. Consequently, a high interaction between oil & gas and ocean based recreation and leisure exists due to the environmental concern about hydrocarbon exploration.
- **Oil & gas construction** – the construction of the natural gas pipeline system may interfere with resource-dependent activities like subsistence fishing and ocean based recreation and leisure. Environmental and safety risks are always present during the construction and operations phases of such a system.
- **Federal/provincial governments** – federal departments including Fisheries and Oceans Canada, Transport Canada and Environment Canada exercise regulatory authority over many ocean activities, with others covered by various territorial departments in the LOMA.

Economic Interdependence Matrix for the Beaufort Sea LOMA



5. Economic impact

Economic impacts for Beaufort LOMA activities are most meaningfully described and quantified using direct measures such as employment and income outlined in the text. Lack of data, coupled with the absence of a developed industrial/service economy and strong linkages among sectors, limits the applicability of input-output modeling to estimate impacts.

VII

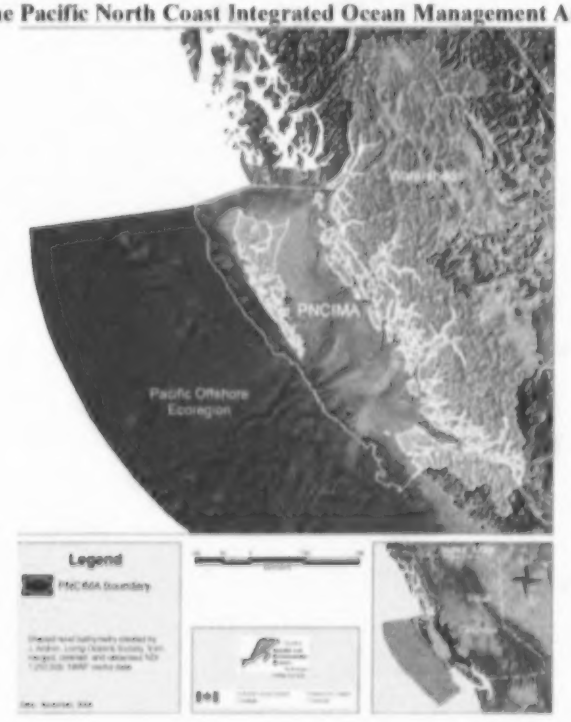
PACIFIC NORTH COAST INTEGRATED MANAGEMENT AREA

1. The area

The Pacific North Coast Integrated Management Area (PNCIMA) is one of five priority Large Ocean Management Areas (LOMAs) identified under the Ocean Action Plan for integrated management planning. Known locally as the Queen Charlotte Basin, this LOMA covers an area of approximately 88,000 square kilometres extending from the Canada-Alaska border in the north to Brooks peninsula on the Northwest Vancouver Island, and Quadra Island and Bute Inlet in the south. The area extends seaward to the foot of the continental slope and on the landward boundary (Figure 7.1).

The area's rich marine ecosystem supports various resource-based activities including fishing, aquaculture, water transportation and tourism. These activities generate substantial employment and income, making major contributions to the economic health of the province and sustaining many adjacent coastal communities.

Figure 7.1: The Pacific North Coast Integrated Ocean Management Area (PNCIMA)



2. Methodology

This report provides an overview of the range of human activities occurring in the PNCIMA, and quantifies these activities using various industry-specific indicators. The report extends this analysis by providing an estimate of the economic impact of these activities in terms of their contribution to gross domestic product, employment and household income. The report also provides an overview of the interactions between and among the various activities.

Estimating the economic impact of ocean activities for the PNCIMA is carried out in three steps.

- First, DFO planning documents providing an overview of the nature and extent of human activities are reviewed and synthesized.*
- Second, for each of the activities, industry and economic data are compiled or estimated from statistical sources and government departments. The challenge in this step is to ensure on the one hand that the data capture only activities occurring within the PNCIMA boundary, and on the other hand ensuring the data accurately reflect the extent of each activity. Unless otherwise indicated in the text, activities are quantified using a bottom-up approach based on location-specific data. For example, the estimate of the economic significance of the fisheries is based on catch and effort data by fishery for statistical areas within the PNCIMA. Similarly, estimates for ports and shipping are based on port-specific cargo levels and vessel movements.
- Third, a top-down approach is used to estimate the economic impact (GDP, employment, household income) of PNCIMA activities. This approach starts with provincial impacts and assigns or distributes them to the PNCIMA using an indicator linking activity and location (e.g., share of landings in the case of fisheries, or share of cargo tonnages in the case of shipping).

3. Human Activity

Fishing

The landed value of commercial fishing in British Columbia in 2006 was about $324 million based on landings of 221,000 tonnes. Groundfish accounted for about 45% of the landed value, salmon for 18%, while wild shellfish landings added another 30%. Overall, the PNCIMA accounted for about 67% of total landed value.

Table 7.1: Commercial Landings and Landed Value PNCIMA, 2002-2006[1]

Landings	2002	2003	2004	2005	2006
Value ($ millions)	218	232	232	221	218

1. See Note 1

Salmon landed value was $59.5 million, of which the PNCIMA accounted for 83% or a little over $50 million. Shellfish landed value was about $90 million, of which about $52 million (57%) was attributed to the PNCIMA.

* MacConnachie, S. et al, Marine Use Analysis of the Pacific North Coast Integrated Management Area, 2007; and GSGislason & Associates Ltd., *The Economic Contribution of the Ocean Sector in British Columbia*, prepared for Canada/British Columbia Coordination Committee, 2007.

Groundfish and other species made up the remaining $163 million. However, hake, which accounts for about $17 million is caught mainly off the west coast of Vancouver Island, so the relevant total is $147 million. The major species sablefish (landed value about $48 million), halibut ($40 million) and rockfish ($21 million) and herring (about $13 million) account for 83%. The remaining $25 million is spread across numerous species such as dogfish, flounder, lingcod, Pacific ocean perch and sole. A review of catch and effort data indicates that the PNCIMA accounts for 85% of the value of sablefish landings, about 100% of the halibut landed value, about 70% of the rockfish landed value[4], 25% of the herring landed value[5] and 70% of the other species landed value. On this basis, the landed value of all groundfish in the PNCIMA in 2007 was about $117 million.

In 2006 fisheries within the PNCIMA provided employment for an estimated 1,260 fishers (about 60% of the provincial total), operating from 1,800 registered fishing vessels (Table 7.2).

Table 7.2: Employment and active fishing vessels in the PNCIMA, 2006

	Number employed[1]	Number of registered fishing vessels[2]
Fisheries	1,260	1,800

1. See Note 2
2. See Note 3

Aquaculture

British Columbia is the fourth largest producer of farmed salmon in the world, and a major producer of shellfish in Canada. Divided between finfish, shellfish, and marine plant production, the aquaculture industry in the PNCIMA accounts for approximately $84 million (Table 7.3). It is comprised of about 100 major producing finfish and shellfish, as well as several small-scale operators producing marine plants. Government spending related to aquaculture will be captured under the relevant government departments. The concern here is to provide a framework to rationalize the allocation of appropriate spending activity to the PNCIMA.

- **Finfish Aquaculture** – there are 60 finfish hatcheries in BC, seven of them located in the PNCIMA[6]. Reported in PNCIMA (2007) reports 79 marine finfish licenses operating in the LOMA in 2004. More recent 2007 data from the BC Ministry of Agriculture and Lands[7] shows 130 marine finfish sites in BC, with 84 (65%) located in the PNCIMA.

- **Shellfish Aquaculture** – the majority of shellfish farming in BC occurs south of the NCIMA, where conditions are more suitable to farmed shellfish species. There are 11 shellfish farms located in PNCIMA, representing 2.4 percent of the provincial total (MAFF, 2003). There are, however, fifteen pilot projects under way on the North Coast and on the Queen Charlotte Islands with the aim to determine the feasibility of shellfish aquaculture in these areas.

- **Marine Plants** – The marine plant industry consists mainly of small-scale operators harvesting less than 100 tonnes a year.

4 Based on the allocation of trawl effort in the PNCIMA.
5 This fishery is largely a roe fishery.
6 Data from BC Ministry of Environment
7 http://www.al.gov.bc.ca/fisheries/finfish_main.htm

Table 7.3: Aquaculture activity for the PNCIMA, 2006[1]

	Number employed	Number of Sites	Product value ($ Million)
Aquaculture	525	95	85

1. See Note 4

Fish Processing

The fish processing industry in British Columbia consists of 240 processing facilities generating approximately $1 billion in exports. The number of processing facilities in the PNCIMA represents about 5% of the provincial total. Historically reliant on the commercial groundfish and shellfish industry, fish processing has started to shift toward aquaculture (primarily salmon) as an increasing source of supply. Based on the share of provincial landed value in 2006, the fish processing plants in the LOMA generated $487 million in product value (Table 7.4).

Table 7.4: Fish processing activity in the PNCIMA, 2006

	Number employed[1]	Number of Plants[2]	Production ($ Million)[3]
Fish processing	185	13	487

1. See Note 5
2. See Note 6
3. See Note 7

Oil and Gas Exploration and Extraction

Petroleum reserves found in BC's offshore waters represent a potentially significant energy resource and opportunity for the people of the province. Most of the promising areas lie in the PNCIMA. For example, numerous oil, tar and natural gas seeps on the Queen Charlotte Islands triggered drilling for oil in the region as early as 1913, when the first well was drilled on Graham Island. Between 1949 and 1971, eight additional wells were drilled. After the first recorded offshore seismic activity in 1958, the Province of BC imposed a moratorium on exploration drilling in the coastal waters between Vancouver Island and Alaska by 1959. However, in 1961 Shell Canada Ltd. began acquiring exploration permits in Hecate Strait and Queen Charlotte Sound, which led the company to conduct offshore seismic surveys between 1963 and 1968, collecting a total of 32,300 km of reflection seismic data[8]. Previous assessments suggest that the Queen Charlotte Basin could contain 1.6 billion m^3 and 0.7 trillion m^3 of natural at the 50% probability level.

Although there has been renewed interest in the BC offshore over the past several years, both the federal government moratorium (enacted in 1972) and the provincial government moratorium (enacted in 1989) prevent offshore exploration activity and consequently there have been no significant economic impacts. However, the provincial government has been actively expanding its knowledge and interest in the BC offshore. The associated spending is captured under the provincial government department oceans related expenditures.

8 Smyth, R, Chief Science Officer, BC Offshore Oil and Gas Team, *BC's Offshore Petroleum Recent Developments*, presented to the Canadian Society of Petroleum Geologists, November 4th, 2004, Calgary.

Marine Transportation

Historically, Transport Canada's Marine Sector or Fisheries and Oceans Canada's Small Craft Harbours managed all public ports in the PNCIMA. As a result of the Transport Canada divesture program, most ports in the PNCIMA are locally operated. There are 26 active ports in the area, of which the ports of Prince Rupert and Kitimat are considered the largest. Combined, these two major ports handled about seven million tonnes of cargo in 2005 primarily consisting of grains, coal, and inputs and products from two major industries in Kitimat (Table 7.5). The new $170 million container facility at Prince Rupert has an annual capacity of 500,000 TEUs, with plans to expand to as much 4,000,000 TEUs by 2020 depending on demand. The container facility commenced operation in early 2008 and is expected to create 300 fulltime jobs, adding a substantial increase in port related economic impacts in Prince Rupert.

Vessel traffic in the PNCIMA includes a wide range of ship types in the commercial, fishing and recreational fleets. With the exception of the Prince Rupert and Kitimat port facilities, the majority of the large vessel traffic in the PNCIMA is mainly transiting the area on its way from Vancouver or Seattle to Alaska or Asia. With the exceptions of tankers bound for Prince Rupert or Kitimat as destination ports, tanker vessel traffic, such as liquid gas, petroleum products and vegetable oils, tends to transit outside of the PNCIMA.

Table 7.5: Vessel movement and tonnes of cargo, 2005[1]

	Domestic		International		Total	
	Vessel Movement	Tonnes of Cargo (000s)	Vessel Movement	Tonnes of Cargo (000s)	Vessel Movement	Tonnes of Cargo (000s)
PNCIMA	21	86.3	969	6,864	990	6,950

1. See Note 8

Ferry services in the PNCIMA are provided primarily by BC Ferries, which directly operates seven routes and four on a sub-contract basis. Major routes in this LOMA include service between Prince Rupert and Haida-Gwaii, Port Hardy and Prince Rupert, and the Discovery Coast Passage at Port Hardy.

Table 7.6: Ferry Industry for PNCIMA, 2006[1]

	Employment	Passengers (000)	Vehicles (000)
Ferry Industry	250	1,900	130

1. See Note 9

Ocean-based tourism

Ocean tourism is broken down into three expenditure-driven areas: cruise ship activity, coastal tourism in the form of water-based recreational activities, and marine recreational fishing. These three activities are well defined and some attempt has been made to quantify their economic significance based on various reports and surveys. Overall, ocean tourism in the LOMA accounts for an estimated $225 million in spending annually out of a provincial total of just over $2.0 billion.

BC ports handled nearly 600 cruise ship calls in 2007 for a combined 1.4 million passengers during the cruise season. There are an estimated 300+ cruise ship trips passing through the PNCIMA annually. The ports of Victoria, Prince Rupert, Nanaimo and Campbell River primarily serve as a ports-of-call for Alaska cruises that originate at U.S. ports and Vancouver, while Vancouver is mainly a boarding and unloading port for Alaska cruises. The Port of Vancouver processed two-thirds of the British Columbia passengers during 2007 and is by far the largest of the five ports. Two of the five ports, Prince Rupert and Campbell River lie with the PNCIMA.

Cruise ship passenger visits at Prince Rupert have increased sharply since 2003, when they started with 3,000. By 2007, visits had grown to more than 98,000. The first visits to Campbell River started in 2007 with slightly more than 2,300 passengers disembarking.

Table 7.7: Cruise ship traffic in ports within the PNCIMA[1]

	2004	2005	2006	2007
Passenger Visits	60,100	97,970	63,767	100,659

1. See Note 10

Total cruise related expenditure (passenger and crew spending only) in BC in 2006 is estimated at just over $400 million. We estimate that about $4.0 million of this expenditure occurs in the PNCIMA (Table 7.8).

Table 7.8: Direct Cruise-related Expenditures for PNCIMA, 2004-2006 ($Millions)[1]

	2004	2005	2006	2007
PNCIMA	4	6	4	7

1. See Note 11

The PNCIMA is the major destination for saltwater recreational fishing and an important provider of fresh water fishing opportunities in British Columbia. The 2000 and 2005 *Surveys of Recreational Fishing in Canada* indicate that expenditures by those engaged in saltwater fishing in British Columbia generate an estimated $662 Million in 2006. The LOMA accounts for about 27% of the total (Table 7.9).

Table 7.9: Saltwater fishing expenditures for PNCIMA, 2002-2006 ($Millions)[1]

	2002	2003	2004	2005	2006
PNCIMA	137	147	158	169	180

1. See Note 12

Coastal tourism includes ocean touring (whale watching, sightseeing, coastal hiking, diving and kayaking), as well as sailing, cruising and visiting beaches and other marine locations. Statistical agencies and departments of tourism in Canada do not systematically track and report demand and expenditures for these activities. Nonetheless, it is possible to develop an estimate of coastal tourism expenditures using various surveys and studies (see Appendix 2). These surveys identify specific marine activities and by linking average daily expenditures to days spent in these activities (based on survey results) within the LOMA, an aggregate expenditure level may be estimated.

Following this methodology, Table 7.10 reports that participation in coastal activities in the LOMA generated an estimated $50 million in tourism expenditures in 2006 (about 3% of the provincial total). It should be noted that this estimate includes expenditures by resident and non-resident tourists, as well as local residents.

Table 7.10: Coastal tourism expenditures for PNCIMA, 2002-2006 ($ Million)[1]

	2002	2003	2004	2005	2006
PNCIMA	n.a.	n.a.	n.a.	n.a.	50

1. See Note 13

Marine Construction

Marine construction does not conform to a NAICS industry for which data are readily available. This activity includes building wharves and breakwaters, as well as dredging operations. Port authorities and operating companies conduct construction at major ports, as does DFO and local authorities at small craft harbours. For the LOMA as a whole, construction expenditures averaged about $23 million (Table 7.11) over the 2002-2006 period (18% of the provincial total).

- **Ports** – Prince Rupert had capital expenditures in the $65 million range in 2006, with a 5-year average of $18.4 million.

- **Small Craft Harbours** – The program is comprised of 100 fishing harbours throughout the province of British Columbia. Annual capital expenditures averaged $3.5 million over 2002-2006, with LOMA expenditures averaging about $1.2 million.

- **BC Ferries** – BC Ferries is involved in construction to its shore-based infrastructure. The organization averaged approximately $57.6 million in annual spending in construction on terminals, buildings, and marine structures over the 2002-2006 period. Of this, $3.4 million was spend in the PNCIMA.

Table 7.11: Ports & harbours capital expenditures for PNCIMA, 2002-2006 avg.

	Capital Expenditures ($ millions)
Prince Rupert[1]	18.4
Small Craft Harbours[2]	1.2
BC Ferries[3]	3.4
Total	23.0

1. See Note 14
2. See Note 15
3. See Note 16

Shipbuilding and boat building

The ship and boat building industry in British Columbia is comprised of four major shipyards located in Victoria, Nanaimo, and North Vancouver. Additionally, there are about 65 boat-builders, designers, and suppliers scattered around the province. None of the yards is located within the boundary of the PNCIMA. Industry Canada data shows that as recently as 2006, the industry generated revenues of approximately $446 million (Table 7.12).

Table 7.12: Ship & boat building industry in British Columbia, 2002-2006 [1]

	2002	2003	2004	2005	2006
Number of companies	-	-	356	304	333
Revenues ($Million)	400	445	394	413	446

1. See Note 17

Government Services

Ten federal and nine provincial government departments and agencies in British Columbia play a role in ocean related activity. They contribute to the value of the ocean sector through direct employment, capital spending, operations and maintenance spending, spending on research and development, and in the support of initiatives in the non-profit and not-for-profit sectors.

Since PNCIMA-specific employment and expenditures are not available, estimates were obtained by proportioning various industry-specific allocation factors to aggregate provincial amounts. Overall, ocean-related governmental services generated approximately $370 million in expenditures and 3,510 full-time equivalent jobs in 2006. See Appendix 2, Table A2-1 for details on allocation factors.

Table 7.13: Expenditure and Employment of Major Federal and Provincial Departments, 2006

Governments	Employment (FTE)	Expenditures ($ Millions)
Federal[1]	3,360	345
Provincial[2]	150	24
Total	3,510	369

1. See Note 18
2. See Note 19

Universities and ENGOs

University of British Columbia, University of Victoria and other schools, as well as their affiliated institutes offer marine programs and conduct research along the Pacific coast and in the Arctic. National and local Environmental NGOs also pursue marine programs. Estimates of program and research expenditures are available at the provincial level, though reliable estimates of activity and spending within PNCIMA are not available. In the absence of this detail, given the location of the universities and research facilities and the offices of ENGOs, and given the relative significance of marine activities within the LOMA, we notionally allocate 20% of regional marine expenditures to PNCIMA.

4. Interactions

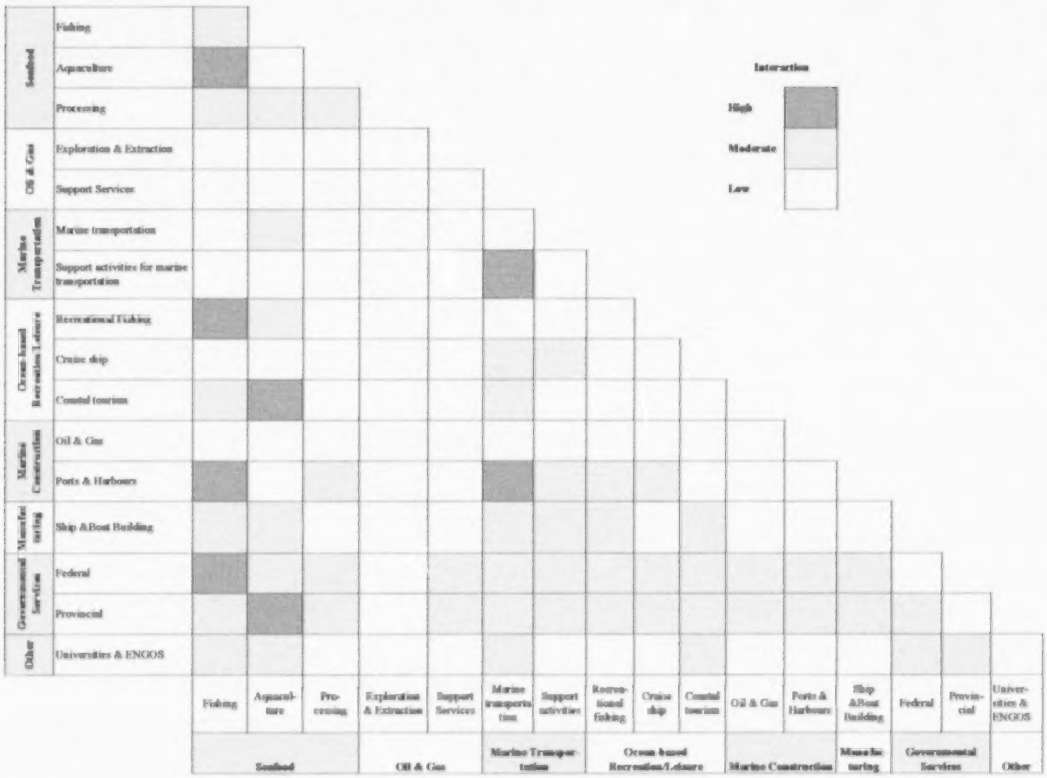
The PNCIMA is a recently designated ocean management area for which information on interactions is somewhat limited. The relatively small size of the PNCIMA concentrates interaction within a fairly narrow marine region, particularly among water transportation and fishing industries.

This high-level discussion of interactions is qualitative in nature. The interactions focus on the existence of economic interdependence (negative or positive) between or among activities. Many negative interactions between and amongst activities are low to moderate, reflecting in part the physical separation of most activities. Where there had been conflicts, these have been resolved or minimized over the years, either through the cooperation of the interests or through policy and regulation. Some activities are positively linked, with one activity reinforcing or building on

another. Interactions are summarized in the matrix below, with relative intensity indicated by shading (white=weak; black=strong). Among the highlights:

- **Fishing** – interactions related to the fishing industry occur across a number of industries. A strong interaction exists between aquaculture and fisheries arising from concerns that farmed salmon adversely affect wild populations through contamination, disease and escape from pens leading to species interactions. The strong interaction with fish processing reflects the mutual dependence of the industries. The fishery depends heavily on small craft harbours for berthing and facilities to unload and load vessels. The fishery provides an important market for the boatbuilding industry. A strong interaction with the federal government arises from the Fisheries and Oceans Canada mandate for fisheries management. Spatial interaction with passenger and cargo vessels occurs as traffic increases in both groups.
- **Aquaculture** – this industry in the PNCIMA is small yet active, focusing primarily on farmed salmon. There is limited competition with the commercial fisheries for ocean space, however, environmental and species interaction issues are a concern. Aquaculture provides a small market for the boatbuilding industry. A strong interaction with the provincial government arises from the Fisheries and Aquaculture mandate for licensing and regulation, as well as potential competition for preferred sites (farms vs. marine protected areas). Interactions with coastal tourism are strong as space is shared with aquaculture farms along the coastline.
- **Processing** – there is a moderate economic interaction amongst processors arising from the competition for raw material. Interaction with commercial fisheries is declining in favor of aquaculture products as an increasing source of supply. The system of small craft harbours facilitates landing and trucking raw material from remote sites to processing plants. Interaction with the provincial government arises from the Fisheries and Aquaculture mandate for policy, licensing and regulation.
- **Oil & gas** – oil and gas exploration interaction in the PNCIMA is minimal as a moratorium is in place. Tanker traffic within the PNCIMA is limited by a voluntary industry restriction zone. The removal of the moratorium is a possibility, at which time exploration and development could create strong interactions with fisheries, transportation, and government. Presently, interaction remains on the level of proposed development and related concern.
- **Water transportation** – transportation interaction in the PNCIMA is driven by three major ports and the cruise ship industry. Tourism benefits from cruise ship activity as well as coastal ferry services. Federal and provincial governments provide regulatory oversight, and also provide financial support for ferry services. Large vessel and pocket cruise ship industries have user conflicts with other marine vessels, and concerns have been raised over fisheries and aquaculture impact by cruise ship waste disposal and acoustic disturbance.
- **Ocean based recreation and leisure** – good port and harbour facilities are integral to all three components – recreational fishing, cruise ship and coastal tourism (e.g, whale watching, sailing/boating, kayaking, etc.). Aquaculture gear presents minimal hazard to navigation, but alters aesthetic of and access to pristine coastal areas. Debate has arisen between recreational fishers and the aquaculture industry over impact on wild salmon stocks.
- **Oil & gas construction** – No oil & gas activity has occurred.
- **Federal/provincial governments** – federal departments including Fisheries and Oceans Canada, Transport Canada and Environment Canada exercise regulatory authority over many ocean activities, with others covered by provincial departments. Concerns have been raised over the ability of defense, safety, and security services to meet increasing demands imposed by growing cruise ship and cargo traffic.

Economic Interdependence Matrix for the PNCIMA



5. *Economic impact*

Ocean activity in the LOMA contributes over $1.4 billion in GDP to the British Columbia economy, creating almost 20,000 jobs and generating about $930 million in total income (Table 7.14).

- **Fishing** – the growth of farmed fish, wild shellfish and groundfish has allowed the fisheries economy to regain its former strength following the contraction in the 1990s due to the decline in salmon stocks. Current salmon landings account for about one-quarter of the value in 1990. The fisheries are fully utilized and any growth in economic impact in the future would depend on a recovery of salmon stocks, and would also depend heavily on market conditions and exchange rates.
- **Aquaculture** – Driven primarily by farmed salmon, aquaculture continues to be a major economic contributor to the provincial economy. Strong demand, advances in technology and declines in wild fisheries have been the key drivers of this growth. However, current economic conditions along with spatial and environmental conflicts pose major threats to the industry.

- **Processing** – The future of fish processing is tied closely to conditions in the commercial and farmed fisheries, particularly salmon, which historically has provided much of the raw material for processing operations. Future economic impact hinges mainly on resource recovery as well as markets and exchange rates.
- **Offshore oil and gas** – Future economic impacts arising from exploration activity depends on whether the current moratorium would be lifted. If so, exploration activities are likely to begin in the Queen Charlotte Basin area (assuming that First Nations issues could be resolved). Given the often lengthy period between the commencement of exploration and discoveries of commercial quantities of hydrocarbons, and then between discoveries and actual field development and production, any substantial impacts would be expected to occur well into the future.
- **Water transportation** – About half the cargo moving through British Columbia ports goes through ports in the LOMA, making this sector one of the most important sources of economic impact. The completion of the Prince Rupert container terminal represents a major opportunity for growth in the long term.
- **Tourism** – Already a major factor in the British Columbia economy, this sector still has considerable potential, with the expansion of adventure tourism and the continuing growth of the cruise ship industry.
- **Marine construction** – West coast ports are expanding throughout capacity in response to growing demands arising from Chinese exports to North America and from growing demand for Canadian raw materials. The completion of the Prince Rupert container terminal in late 2007 represents the largest investment in port facilities in the LOMA and one of the largest on the coast of British Columbia.

Table 7.14: Economic impact of marine activities in the PNCIMA

GDP and Income in $000s Employment in full-time equivalent	British Columbia output value $000s (1)	LOMA allocation factor (2)	Direct			Indirect			Induced			Total		
Ocean activity			GDP	Employment	Income	GDP	Employment	Income	GDP	Employment	Income	GDP	Employment	Income
Commercial fishing	318,909	0.67	96,151	297	55,554	34,187	449	21,367	44,315	231	26,922	174,653	977	103,843
Aquaculture	427,466	0.20	23,083	339	10,259	25,648	356	12,824	16,569	215	8,079	65,300	911	31,162
Fish processing (3)	727,739	0.67	147,251	2,923	82,889	58,510	642	26,330	49,933	743	26,622	255,694	4,307	135,841
Oil & gas exploration/extraction														
Support activities for oil & gas														
Water transportation	1,911,000	0.06	47,297	526	31,532	21,021	262	11,562	23,228	244	15,083	91,546	1,031	58,176
Support activities for transportation	2,484,000	0.06	71,042	951	43,718	21,859	495	16,394	31,587	448	21,039	124,488	1,894	81,152
Tourism & recreation	2,743,930	0.09	106,190	2,470	86,434	74,086	1,235	44,452	61,294	1,148	45,810	241,570	4,853	176,695
Oil & gas facilities construction														
Ports and harbours construction	132,567	0.18	9,545	143	6,204	7,159	119	4,295	5,679	81	3,675	22,383	344	14,174
Ship and boat building	446,000	0.00												
National Defence	550,225	0.25	112,796	1,871	112,796	13,756	243	8,253	43,028	656	42,367	169,579	2,772	163,417
Fisheries & Oceans	302,648	0.67	95,304	1,452	95,304	58,805	274	14,194	52,397	535	38,324	206,505	2,261	147,822
Other federal departments	23,850	0.20	3,101	33	3,101	859	15	477	1,346	15	918	5,305	63	4,496
Provincial departments	155,780	0.16	5,307	27	5,307	1,137	64	1,971	2,191	28	1,194	8,635	119	8,472
Universities & ENGOs	77,800	0.20	6,098	94	4,779	1,236	0	412	2,493	34	1,817	9,827	128	7,008
Total	9,983,005		723,164	11,128	537,877	318,262	4,152	162,531	334,059	4,379	231,851	1,375,485	19,658	932,259

1. See Gardner Pinfold, *Economic Impact of Marine Related Activities in Canada*, 2009, (prepared for DFO) for sources and derivation of output values.
2. See Appendices 1 and 2 for derivation of allocation factors.
3. Fish processing impacts have been adjusted to remove double counting of indirect and induced impacts of commercial fishing.

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APPENDIX 1: SOURCES AND ASSUMPTIONS

1. Data sources by industry

Obtaining essential economic data represents the greatest challenge in producing a report of this kind. The difficulty presents itself at the industry level for certain activities, and also at the geographic level.

- **At the industry level**, data may be unavailable because the marine activity does not conform to an established NAICS classification; it may cut across several industries or form just part of a broadly based industry. These constraints may affect the ability to estimate impacts, but at the very least affect the approach taken and confidence in the results.
- **At the geographic level**, data are often unavailable for reasons of confidentiality – the number of establishments in the industry in that area may be too few to allow reporting – or because the particular area is not one well covered by Statistics Canada. This may present difficulties if, as in this case, analysis and reporting are required at a regional level.

These particular challenges do not affect all marine activities, but few activities are without at least some analytical challenge. Taking each in turn:

- **Commercial fisheries** – Two sources of data are available for value of output data. DFO publishes value of landings data for the commercial fisheries by province with about a one-year lag. These data are available on the DFO website: (http://www.dfo-mpo.gc.ca/index-eng.htm). Statistics Canada uses these data for its commercial fisheries data at the provincial level, though with a 3-4 year lag (CANSIM 381-0016 http://estat.statcan.gc.ca/cgi-win/CNSMCGI.EXE). Statistics Canada relies on these data, its own surveys and also administrative (taxation) data to calibrate its input-output model and to develop annual GDP estimates.

  Employment estimates for the fisheries represent one area of weakness. It is possible to estimate the level of participation from employment insurance data (number of claims), but at best this gives a lower bound on the numbers because not all participants claim. DFO fisher registration data would provide an upper bound, but not all those who register to fish actually do so. There are no official data on full-time equivalents, and no reliable way to estimate this. In part this reflects the status of crewmembers – they are classified as independent contractors, not employees – and in part the seasonal nature of the fisheries. Work is not confined to the time spent fishing, but also extends to preparation time before and maintenance time at the end of the season. The employment estimates contained in the impact analysis are derived from the results of the input-output model runs. The model calculates the level of employment needed to reach a given output level based on income levels derived from administrative and survey data.

- **Aquaculture** – There is good reporting of aquaculture statistics (including production and value by species, number of sites and numbers employed) by provincial departments: (http://www.fishaq.gov.nl.ca/stats/default.stm
http://www.gov.ns.ca/fish/aquaculture/stats/index.shtml
http://www.gov.pe.ca/fa/aqu-info/index.php3
http://www.gnb.ca/0168/01680004-e.asp
http://www.env.gov.bc.ca/omfd/reports/index.html
Value added accounts for the industry in each province are published by DFO (http://www.dfo-mpo.gc.ca/communic/statistics/aqua/index_e.htm) and Statistics Canada (CANSIM 381-0016 http://estat.statcan.gc.ca/cgi-win/cnsmcgi.pgm. There is about a one-year lag in reporting by the province and DFO. Statistics Canada relies on production data, its own surveys and also administrative (taxation) data to calibrate its input-output model and to develop annual GDP estimates.

- **Fish processing** – Annual output value and other key manufacturing statistics from Statistics Canada is available for 2004-2006 online through CANSIM 301-0006, and for earlier years from CANSIM 301-0003 and 301-0005 http://cansim2.statcan.ca/cgi-win/cnsmcgi.exe?Lang=E&RootDir=CII/&ResultTemplate=CII/CII___&Array_Pick=1&ArrayId=3010006 Export statistics are available online from the Industry Canada Strategis website
http://strategis.gc.ca/sc_mrkti/tdst/tdo/tdo.php?lang=30&headFootDir=/sc_mrkti/tdst/headfoot&productType=HS6&cacheTime=962115865#tag

  Other industry data such as number of plants and employment are also compiled by some provinces, but there is a lack of consistency in the provincial approaches. One issue with the output data is inclusion of imported raw material in the production and export statistics. This is a concern if the rationale for including seafood processing is its linkage with *domestic* fisheries. Otherwise it is not an issue (this study does not consider this an issue). The contribution to output of imported raw material can be substantial, e.g., New Brunswick lobster processors rely heavily on Maine lobster as a source of raw material.

- **Oil & gas** – GDP and output data for the offshore oil & gas industry in Newfoundland and Labrador and Nova Scotia are suppressed by Statistics Canada due to confidentiality restrictions. Value of output can be estimated using published production data (quantity) applied to average market prices. Monthly production data can be obtained from the CNSOPB (http://www.cnsopb.ns.ca/production.php). Value can be derived by using monthly average natural gas import prices (U.S. northeast) obtained from the U.S. EIA (http://tonto.eia.doe.gov/dnav/ng/ng_move_poe1_a_EPG0_PRP_DpMcf_a.htm) and adjusted for the Canada-U.S. exchange rate and netting out the pipeline toll (to obtain the producer's net-back revenue).

  For the Newfoundland and Labrador offshore, this means obtaining monthly production data (from the CNLOPB) and deriving revenue by using monthly average oil prices based on a benchmark crude with similar specifications (e.g., Brent) and adjusting for the Canada-U.S. exchange rate (oil is traded in U.S. dollar terms). For Nova Scotia, this means obtaining monthly production data (from the CNSOPB) and deriving revenue by using monthly average natural gas import prices (U.S. northeast) adjusted for the Canada-U.S. exchange rate and netting out the pipeline toll (to obtain the producer's net-back revenue).

Other data on the offshore industry tends to be reasonably well reported by the offshore boards, though expenditure data on project development vs. operations are not distinguished in CNSOPB reports. Unless the analyst has access to this detail (which is the case for this analysis), impacts could only be reported with wide confidence limits.

- **Marine transportation** – GDP and output data for marine transportation (NAICS 4831) are available at the national level, but are suppressed by Statistics Canada for some provinces in some years due to confidentiality restrictions. These data only cover the "for-hire" segment of the industry, not the marine transportation activity of companies that ship using their own vessels (referred to as "own-account" shipping). Though Statistics Canada has developed a satellite account for "own-account" activity, for reasons having to do with definitional purity, the value of this activity is not included in the analysis and impact results of this report. Since the satellite account analysis concluded that the value of own-account activity is actually greater than that of for-hire, the results set out in this report must be considered highly conservative.

  Another serious issue is that no data at all are available for Support Services for Water Transportation (NAICS 4883) because Statistics Canada incorporates this activity in the broader grouping, Support Services for Transportation (NAICS 488). If a complete picture of the water transportation sector is to be developed, then it is necessary to estimate the contribution of support activities using indirect methods. The estimate contained in this report is based on historical data (1997-2000) that distinguished NAICS 48311 and 4883 and allowed the relative contribution to GDP of the activities to be determined (the ratio of 4883/48311 is 1.5:1.0). This ratio is confirmed by current U.S. data for these industries.

- **Tourism and recreation** – Comprehensive data on the tourism sector are not systematically compiled in Canada. This study relies on several secondary sources. Two are focused on specific marine related tourism activities, cruise ship travel and recreational fishing, with expenditure data available on a provincial basis. The others – Statistics Canada, *Travel Survey of Residents of Canada*, 2007; Statistics Canada *Travel Activities and Motivations Surveys*, 2000, 2006; Genesis Public Opinion Research Inc. & Smith Gunther Associates, *Economic Impact of the Canadian Recreational Boating Industry*: 2006 (data on boating are available for 2006 only) – address tourism generally, but allows the analyst to extract participation data (days and expenditures) on specific activities including several with an oceans focus (coastal hiking, diving, kayaking, sailing, boating visiting beaches). Ideally, the analyst would obtain electronic files of the survey databases from DFO and Statistics Canada in order to extract the relevant data (these were obtained for this analysis).

  Taken together, the three sources provide a good approximation of the economic impact of ocean tourism. The surveys cover international and resident tourists, as well as local residents taking day trips to local beaches.

  With the data, the next step is to run the expenditures through the input-output model. But tourism is not one of the 303 industries for which input and output vectors have been developed in Statistics Canada's model. This means expenditures have to be sorted by industry (the surveys provide a breakdown of expenditures by category) and province, entered into a template provided by Statistics Canada, and submitted to run the model.

- **Marine construction** – GDP and output data are not available for this activity. This is because it is not an exclusively marine activity. For purposes of running the input-output model, marine construction would fall under a broad construction category: other heavy and civil engineering construction (NAICS 2379), which includes both marine- and land-based construction activity. Expenditure data to run the model must be compiled from several sources including individual port authorities (not just for their own data, but for construction expenditures generally in each port), DFO for small craft harbours, DND for naval base capital expenditures, provinces and ferry companies for terminal expenditures and offshore boards for oil & gas development expenditures. These sources would exclude capital spending at private facilities and hence would underestimate overall construction impacts.

- **Shipbuilding and boat building** – Output value is published by Statistics Canada, though data are suppressed in some years due to confidentiality restrictions. Output value from Statistics Canada (subject to confidentiality) is available online through CANSIM 301-0006 (for 2004-2006) and for earlier years from CANSIM 301-0003 and 301-0005. (http://cansim2.statcan.gc.ca/cgi-win/CNSMCGI.EXE?Lang=E&ArrayId=301-0006&Array_Pick=1&Detail=1&ResultTemplate=CII/CII___&RootDir=CII/) For the years under consideration in this study, the data are confidential. Output data was obtained from Statistics Canada by special request.

  Though only data from coastal provinces is used in the impact analysis, it is possible that yards in these provinces may manufacture for freshwater use, and conversely, that manufacturers in inland provinces may build for marine use. This source of error is likely to be small.

  Beyond ship and boats, navigation and research equipment is also manufactured for ocean uses. But the manufacturers do not fall into a unique NAICS marine manufacturing industry. They fall under a broader industry grouping that includes mainly companies producing for aeronautical applications. Consequently, output value, the key statistic that would allow industry impacts to be determined, is unavailable.

2. Data Sources by LOMA

Placentia Bay/Grand Banks LOMA

Table 3.1	**Note 1**	Landings and landed value estimates of shellfish, groundfish and pelagics are derived from the Social, Economic and Cultural Overview and Assessment of the PB/GB LOMA Report. Quota reports and other DFO statistical information on NAFO area 3LNOP were used to fill in some gaps in the data found in the report.
Table 3.2	**Note 2**	Employment is based on employment insurance claimant data derived from the Social, Economic and Cultural Overview and Assessment of the PB/GB LOMA Report. Community accounts were used to fill in some gaps in the data found in the report.
	Note 3	Number of registered fishing vessels is derived from the Draft PB/GB Ecosystem Overview and Assessment Report.
Table 3.3	**Note 4**	Numbers are based on the proportion of aquaculture sites in NAFO area 3Pn, 3Ps and 3L relative to the aggregate provincial numbers. To obtain the proportion, it was necessary to conduct a manual count of sites using a map from the 2006 Newfoundland Seafood Industry Year in Review report.
Table 3.4	**Note 5**	Employment is based on employment insurance claimant data derived from the Social, Economic and Cultural Overview and Assessment of the PB/GB LOMA Report. Community accounts were used to fill in some gaps in the data found in the report.
	Note 6	Number of plants is derived from the Social, Economic and Cultural Overview and Assessment of the PB/GB LOMA Report.
	Note 7	Production is estimated based on the LOMA share of landed value.
Table 3.5	**Note 8**	Data are derived from the Canada-Newfoundland and Labrador Offshore Petroleum Board web site.
Table 3.6	**Note 9**	Data are derived from the Canada-Newfoundland and Labrador Offshore Petroleum Board web site.
Table 3.7	**Note 10**	Data are derived from the Statistics Canada, *Shipping in Canada* 2005 based on ports found in the PB/GB LOMA.
Table 3.8	**Note 11**	Estimates are derived from the Canadian Ferry Operators Association 2006 Annual Report. In some cases, estimates were made based on vessel capacity in order to obtain aggregate passenger, vehicle and employee numbers.
Table 3.9	**Note 12**	Estimates are derived from BREA, *The Economic Contribution of the International Cruise Industry in Canada*, 2007 report.
Table 3.10	**Note 13**	Data are derived from the Department of Tourism, Culture and Recreation performance and outlook reports.
Table 3.11	**Note 14**	Estimates are based on the data derived from the DFO Surveys of Recreational Fishing, 2000 & 2005.
Table 3.12	**Note 15**	Statistics Canada, *Travel Survey of Residents of Canada*, 2007; Statistics Canada *Travel Activities and Motivations Surveys*, 2000, 2006; Genesis Public Opinion Research Inc. & Smith Gunther Associates, *Economic Impact of the Canadian Recreational Boating Industry*: 2006. Data on boating are available for 2006 only.
Table 3.13	**Note 16**	Data are derived from the St. John's Port Authority 2006 Annual report.
	Note 17	Capital expenditures for the province are derived from data provided by DFO. The allocation to the LOMA is based on a proportion of habour sites in the area relative to the provincial total.
	Note 18	Data are derived from expenditure information provided by DND.
	Note 19	Data are derived from the Canada-Newfoundland and Labrador Offshore Petroleum Board web site.

Table 3.14	**Note 20**	Data are derived from Industry Canada, http://www.ic.gc.ca/cis-sic/cis-sic.nsf/IDE/cis33661este.html
Table 3.15	**Note 21**	Estimates are obtained by proportioning various industry-specific allocation factors to aggregate provincial amounts (provincial amounts were provided by the Department of Fisheries and Oceans Canada and Department of National Defence). **DFO:** Based on a percentage of provincial landed values (65%). **DND:** Based on St. John's base spending within the LOMA area (75%).
	Note 22	Estimates are obtained by proportioning various industry-specific allocation factors to aggregate provincial amounts (provincial amounts were provided by various provincial departments and annual financial reports). The overall figure of 75% is a weighted average. **Department of Fisheries and Aquaculture:** Based on a percentage of provincial landed value & aquaculture production value (64%). **Department of Natural Resources:** Based on a percentage of provincial exploration and extraction activities (100%). **Department of Transportation and Works:** Based on a percentage of provincial ferry passengers (61%). **Department of Tourism, Culture and Recreation:** Based on a percentage of provincial ocean-based tourism expenditures (68%). **Canada-Newfoundland and Labrador Offshore Petroleum Board:** Based on a percentage of provincial Ocean-based tourism expenditures (100%).

ESSIM

Table 4.1	**Note 1**	Landings and landed value estimates of key fisheries (i.e. various types of shellfish, groundfish and pelagics) are derived from the Assessment of Quantitative and Qualitative Data and Information from the Social, Economic and Cultural Overview and Assessment of the Scotian Shelf Report. The data corresponds to NAFO area 4VW.
Table 4.2	**Note 2**	Estimated employment is based on key fisheries within ESSIM: snow crab, shrimp, lobster, scallop, groundfish and herring. Reports used included: FRCC report on Sustainability Framework for Atlantic Lobster, Benchmarking Study on Canadian Lobster, Overview of the Atlantic Snow Crab Industry and Impact of User Fees in the Atlantic and Pacific Fisheries.
	Note 3	Estimated number of active vessels is based on key fisheries within ESSIM: snow crab, shrimp, lobster, scallop, groundfish and herring. Reports used included: FRCC report on *Sustainability Framework for Atlantic Lobster*, and several Gardner Pinfold reports: *Benchmarking Study on Canadian Lobster*, *Overview of the Atlantic Snow Crab Industry* and *Impact of User Fees in the Atlantic and Pacific Fisheries*.
Table 4.3	**Note 4**	Data was provided by the Nova Scotia Department of Fisheries and Aquaculture.
Table 4.4	**Note 5**	Data are derived from Gardner Pinfold, *The Nova Scotia Seafood Processing Sector State of the Industry and Competitiveness Assessment report*.
	Note 6	Data are derived from Gardner Pinfold, *The Nova Scotia Seafood Processing Sector State of the Industry and Competitiveness Assessment report*.
	Note 7	Production is estimated based on the LOMA share of landed value.
Table 4.5	**Note 8**	Data are derived from the Sable Project Annual - Nova Scotia Benefit Reports and Statistics Canada.

Table 4.6	**Note 9**	Data are derived from the Statistics Canada, 2005 Shipping in Canada Report based on a selection of ports found in the LOMA.
Table 4.7	**Note 10**	Data are derived from the Canadian Ferry Operators Association 2006 Annual Report.
Table 4.8	**Note 11**	Estimates are derived from the Economic Contribution of the International Cruise Industry in Canada, 2007 report.
Table 4.9	**Note 12**	Data are derived from the Halifax Port Authority, Nova Scotia Department of Tourism and Heritage and the Sydney Ports Corporation.
Table 4.10	**Note 13**	Estimates are based on the data derived from the DFO *Surveys of Recreational Fishing*, 2000 & 2005.
Table 4.11	**Note 14**	Statistics Canada, *Travel Survey of Residents of Canada*, 2007; Statistics Canada *Travel Activities and Motivations Surveys*, 2000, 2006; Genesis Public Opinion Research Inc. & Smith Gunther Associates, *Economic Impact of the Canadian Recreational Boating Industry*: 2006. Data on boating are available for 2006 only.
Table 4.12	**Note 15**	Data are derived from the Halifax Port Authority 2006 Annual report.
	Note 16	Capital expenditures for the province are derived from data provided by DFO. The allocation to the LOMA is based on a proportion of habour sites in the area relative to the provincial total.
	Note 17	Data are derived from expenditure information provided by DND.
	Note 18	Data are derived from the Sable Project-Nova Scotia Benefit Reports
Table 4.13	**Note 19**	Data are derived from Industry Canada, http://www.ic.gc.ca/cis-sic/cis-sic.nsf/IDE/cis33661este.html
Table 4.14	**Note 20**	Estimates were obtained by proportioning various industry-specific allocation factors to aggregate provincial amounts (provincial amounts were provided by the Department of Fisheries and Oceans Canada and Department of National Defence). **DFO:** Based on a percentage of provincial landed values (14%). **DND:** ESSIM arbitrarily assigned 25% of activity based on location of CFB Halifax and size of the Area relative to east coast.
	Note 21	Estimates were obtained by proportioning various industry-specific allocation factors to aggregate provincial amounts (provincial amounts were provided by various provincial departments). **Department of Fisheries and Aquaculture:** Based on a percentage of provincial landed value & aquaculture production value (13%). **Department of Energy:** Based on a percentage of provincial exploration and extraction activities (100%). **Department of Transportation & Infrastructure Renewal:** Based on a percentage of provincial ferry passengers (34%). **Department of Tourism, Culture and Heritage:** Based on a percentage of provincial Ocean-based tourism expenditures (62%). **Canada-Nova Scotia Offshore Petroleum Board:** Based on a percentage of provincial Ocean-based tourism expenditures (100%). **Department of Natural Resources:** Based on a percentage of provincial parks in the LOMA (38%).

GOSLIM

Table 5.1	**Note 1**	Landings and landed value estimates of key fisheries (i.e. various types of shellfish, groundfish and pelagics) are derived from the DFO website including various quota reports that corresponds to NAFO area 4RST.
Table 5.2	**Note 2**	Estimated employment is based on 3 key fisheries within the LOMA: snow crab, shrimp and lobster. Reports used included: FRCC report on Sustainability Framework for Atlantic Lobster, Benchmarking Study on Canadian Lobster, Overview of the Atlantic Snow Crab Industry and Impact of User Fees in the Atlantic and Pacific Fisheries.
	Note 3	Estimated number of active vessels is based on 3 key fisheries within the LOMA: snow crab, shrimp and lobster. Reports used included: FRCC report on Sustainability Framework for Atlantic Lobster, Benchmarking Study on Canadian Lobster, Overview of the Atlantic Snow Crab Industry and Impact of User Fees in the Atlantic and Pacific Fisheries.
Table 5.3	**Note 4**	Estimates are based on data provided by provincial departments and various statistical reports. Estimates include provincial totals for QC and PEI and breakdowns of NL, NB and NS.
Table 5.4	**Note 5**	Data are derived from the Draft Gulf of St. Lawrence: Human Systems Overview Report.
Table 5.5	**Note 6**	Estimates are based on data derived from various provincial statistical documents and LOMA reports. Estimates include provincial totals for QC and PEI and breakdowns of NL, NB and NS.
	Note 7	Production is estimated based on the LOMA share of landed value.
Table 5.6	**Note 8**	Data are derived from the Statistics Canada, 2005 Shipping in Canada Report based on a selection of ports found in the LOMA. Ports within the LOMA are listed in the Draft Gulf of St. Lawrence: Human Systems Overview Report.
Table 5.7	**Note 9**	Estimates are derived from the Canadian Ferry Operators Association 2006 Annual Report. In some cases, estimates were made based on vessel capacity in order to obtain aggregate passenger, vehicle and employee numbers.
Table 5.8	**Note 10**	Estimates are derived from the Economic Contribution of the International Cruise Industry in Canada, 2007 report.
Table 5.9	**Note 11**	Estimates are based on the data derived from the DFO Surveys of Recreational Fishing, 2000 & 2005.
Table 5.10	**Note 12**	Statistics Canada, *Travel Survey of Residents of Canada*, 2007; Statistics Canada *Travel Activities and Motivations Surveys*, 2000, 2006; Genesis Public Opinion Research Inc. & Smith Gunther Associates, *Economic Impact of the Canadian Recreational Boating Industry*: 2006. Data on boating are available for 2006 only.
Table 5.11	**Note 13**	Data are derived from annual reports of various port authorities in the LOMA.
	Note 14	Capital expenditures for the 5 provinces are derived from data provided by DFO.
Table 5.12	**Note 15**	Data are derived from Industry Canada, http://www.ic.gc.ca/cis-sic/cis-sic.nsf/IDE/cis33661este.html
Table 5.13	**Note 16**	Based on expenditure and employment data from the Gulf region, Quebec and Newfoundland. Newfoundland is based on a proportion of provincial landed values (9%).

	Note 17	Estimates were obtained by proportioning various industry-specific allocation factors to aggregate provincial amounts (provincial amounts were provided by various provincial departments and annual financial reports). **Fisheries and Aquaculture:** Based on a percentage of provincial landed value & aquaculture production value (25%). **Natural Resources:** Based on a percentage of provincial exploration and extraction activities (23%). **Transportation:** Based on a percentage of provincial ferry passengers (78%). **Tourism:** Based on a percentage of provincial ocean-based tourism expenditures (53%).

Beaufort Sea LOMA

Table 6.1	**Note 1**	Data are derived from the Marine-Related Economy of NWT and Nunavut report.
Table 6.2	**Note 2**	Data are derived from Department of Indian and Northern Affairs Canada, Northern Oil and Gas Annual Reports
Table 6.3	**Note 3**	Data are derived from Department of Indian and Northern Affairs Canada, Northern Oil and Gas Annual Reports
Table 6.4	**Note 4**	Data are derived from the Statistics Canada, *Shipping in Canada* 2005 based on a selection of ports found in the LOMA.
Table 6.5	**Note 5**	Estimates are based on the data derived from Statistics Canada, Travel Survey of Residents of Canada, 2006. This annual survey identifies seven specific marine activities and by linking average daily expenditures to days spent in these activities (based on survey results) within the LOMA, an aggregate expenditure level may be estimated.
Table 6.6	**Note 6**	Federal expenditure and employment data are derived from Department of Fisheries and Oceans Canada.
	Note 7	Territorial expenditure and employment data are derived from various departmental sources in the NWT.

PNCIMA

Table 7.1	**Note 1**	Landed value estimates are derived from the 2006 British Columbia Seafood Industry Year in Review and Marine Use Analysis of the Pacific North Coast Reports.
Table 7.2	**Note 2**	Employment based on percentage of landed value of all species in the LOMA.
	Note 3	Number of registered fishing vessels is based on a percentage of landed value across all species in the LOMA.
Table 7.3	**Note 4**	Estimates are based on data derived from the Economic Contribution of the Ocean Sector in British Columbia, Marine Use Analysis of the Pacific North Coast report and data from the BC Ministry of Environment.
Table 7.4	**Note 5**	Estimates are based on a percentage of facilities in the LOMA.
	Note 6	Estimates are based on a percentage of facilities in the LOMA.
	Note 7	Production is estimated based on the LOMA share of landed value.
Table 7.5	**Note 8**	Data are derived from the Statistics Canada, 2005 Shipping in Canada Report based on a selection of ports found in the LOMA.
Table 7.6	**Note 9**	Estimates are derived from the Canadian Ferry Operators Association 2006 Annual Report. It was based on a percentage of vessel capacity.
Table 7.7	**Note 10**	Estimates are derived from the Economic Contribution of the International Cruise Industry in Canada, 2007 report.

Table 7.8	**Note 11**	Estimates are derived from the Economic Contribution of the International Cruise Industry in Canada, 2007 report.
Table 7.9	**Note 12**	Estimates are based on the data derived from the DFO Surveys of Recreational Fishing, 2000 & 2005.
Table 7.10	**Note 13**	Statistics Canada, *Travel Survey of Residents of Canada*, 2007; Statistics Canada *Travel Activities and Motivations Surveys*, 2000, 2006; Genesis Public Opinion Research Inc. & Smith Gunther Associates, *Economic Impact of the Canadian Recreational Boating Industry*: 2006. Data on boating are available for 2006 only.
Table 7.11	**Note 14**	Data are derived from the Prince Rupert Port Authority 2006 Annual report.
	Note 15	Data derived from the Marine Use Analysis of the Pacific North Coast report.
	Note 16	Data are derived from the BC Ferries Annual Reports
Table 7.12	**Note 17**	Data are derived from Industry Canada, http://www.ic.gc.ca/cis-sic/cis-sic.nsf/IDE/cis33661este.html
Table 7.13	**Note 18**	Estimates were obtained by proportioning various industry-specific allocation factors to aggregate provincial amounts (provincial amounts were provided by the Department of Fisheries and Oceans Canada and Department of National Defence). **DFO:** Based on a percentage of provincial landed values (67%). **DND:** Based on the number of bases within the LOMA area (0%).
	Note 19	Estimates were obtained by proportioning various industry-specific allocation factors to aggregate provincial amounts (provincial amounts were provided by various provincial departments and annual financial reports). **Agriculture and Lands:** Based on a percentage of aquaculture production value (20%). **Environment:** Based on a percentage of provincial landed value (67%). **Transportation:** Based on a percentage of provincial ferry passengers (6%). **Tourism:** Based on a percentage of provincial ocean-based tourism expenditures (10%). **Economic Development:** Based on a percentage of provincial landed value & aquaculture production value (41%). **Other:** Based on a percentage of provincial landed value & aquaculture production value (41%).

APPENDIX 2: IMPACT ALLOCATION

1. PB/GB LOMA

Fishing (2006)

	Landed Values ($000)
PB/GB LOMA	304,000
NL	469,000
Impact allocation factor	**65%**

Estimates are derived from the Social, Economic and Cultural Overview and Assessment of the PB/GB LOMA Report.

Aquaculture (2006)

	Production Value ($million)
PB/GB LOMA	30.0
NL	52.0
Impact allocation factor	**58%**

Numbers are based on the proportion of aquaculture sites in NAFO area 3Pn, 3Ps and 3L relative to the aggregate provincial numbers.

Processing (2006)

	Production ($millions)
PB/GB LOMA	565
NL	870
Impact allocation factor	**65%**

Production value data are from Statistics Canada 301-0006 with the LOMA share based on landed values.

Exploration & Extraction (2006)

PB/GB LOMA	
NL	
Impact allocation factor	**100%**

100% of extraction and exploration output occurred within the LOMA in 2006.

Freight (2005)

	Tonnes of Cargo (000s)
LOMA	57,144
NL	60,190
Impact allocation factor	**95%**

Data are derived from the Statistics Canada, *Shipping in Canada*, 2005, based on the ports found in the PB/GB LOMA.

Ferry (2006)

	Passengers
PB/GB LOMA	700,000
NL	1,151,927
Impact allocation factor	**61%**

Estimates are derived from the Canadian Ferry Operators Association 2006 Annual Report.

Cruise ship (2006)

	Expenditures ($Millions)
PB/GB LOMA	1.5
NL	**3**
Impact allocation factor	**50%**

Estimates are derived from port-specific data in BREA, *Economic Contribution of the International Cruise Industry in Canada*, 2007.

Marine Recreational Fishing (2006)

	Expenditures ($Millions)
PB/GB LOMA	24
NL	**40**
Impact allocation factor	**60%**

Estimates are based on area-specific fishing data derived from the DFO *Survey of Recreational Fishing*, 2000 & 2005.

Coastal Tourism (2006)

	Expenditures ($Millions)
PB/GB LOMA	137
NL	**190**
Impact allocation factor	**72%**

Based on a weighted average by type of activity, with allocations derived from: census district data in the Statistics Canada, *Travel Survey of Residents of Canada*, 2007; and population data for coastal recreation and boating.

Ports (2006)

	Capital Expenditures ($Millions)
St. John's Port	2.3
NL	2.3
Impact allocation factor	**100%**

Data are derived from the St. John's Port Authority 2006 Annual report.

Small Craft Harbours (2006)

	Number of Harbour Sites
PB/GB LOMA	205
NL	379
Impact allocation factor	**54%**

Data are provided by DFO.

National Defence (2006)

	Capital Expenditures ($Millions)
DND-St. John's	4.0
NL	4.0
Impact allocation factor	**100%**

Data are derived from expenditure information provided by DND.

Oil & Gas (5-year avg. 2002-2006)

	Capital Expenditures ($Millions)
PB/GB LOMA	150
NL	150
Impact allocation factor	**100%**

Data are derived from the Canada-Newfoundland and Labrador Offshore Petroleum Board web site.

Ship & boat building (2006)

	# of companies
PB/GB LOMA	14
NL	34
Impact allocation factor	**41%**

Data are derived from the Industry Canada website and by contacting key associations and government departments.

Government Services (2006)

	% of spending
DND	75%
DFO	65%
Other federal	86%
Provincial	57%

The impact allocation factors represent estimates of each department's expenditures in the LOMA (with weighted averages for other federal and provincial). Where possible, departmental expenditure estimates are tied to the level of activity in the LOMA by the industry for which the department is responsible (eg. DFO and commercial fisheries). DND allocation is notional because no basis for allocation exists.

Universities and ENGOs (2006)

	Expenditures ($Million)
PB/GB	23.3
NL	46.5
Impact allocation factor	**50%**

No LOMA-specific data are available. The allocation factor is notional based on the location of institutions and ENGOs and the high level of economic activity within PB/GB.

2. *ESSIM*

Fishing (2006)

	Landed Values ($000)
ESSIM	89,000
NS	657,000
Impact allocation factor	14%

Estimates are derived from the Assessment of Quantitative and Qualitative Data and Information from the Social, Economic and Cultural Overview and Assessment of the Scotian Shelf Report. The data correspond to NAFO area 4VW.

Aquaculture (2006)

	Production Value ($000)
ESSIM	2,450
NS	35,000
Impact allocation factor	7%

Data are provided by the Nova Scotia Department of Fisheries and Aquaculture.

Processing (2006)

	Production ($millions)
ESSIM	126
NS	899
Impact allocation factor	14%

Production value data are from Statistics Canada 301-0006 with the LOMA share based on landed values.

Exploration & Extraction (2006)

	Production ($millions)
ESSIM	1,014
NS	1,014
Impact allocation factor	100%

100% of extraction and exploration output occurred within the LOMA in 2006.

Freight (2005)

	Tonnes of Cargo (000s)
ESSIM	47,946
NS	51,743
Impact allocation factor	93%

Data are derived from the Statistics Canada, *Shipping in Canada*, 2005 based on ports found in the LOMA.

Ferry (2006)

	Passengers
ESSIM	405,336
NS	1,205,336
Impact allocation factor	34%

Estimates are derived from the Canadian Ferry Operators Association 2006 Annual Report.

Cruise ship (2006)

	Expenditures ($Millions)
ESSIM	34
NS	34
Impact allocation factor	100%

Estimates are derived from port-specific data in BREA, *The Economic Contribution of the International Cruise Industry in Canada*, 2007. Both ports of call, Halifax and Sydney, fall within the LOMA.

Marine Recreational Fishing (2006)

	Expenditures ($Millions)
ESSIM	8
NS	20
Impact allocation factor	40%

Estimates are based on area-specific fishing data derived from the DFO *Survey of Recreational Fishing*, 2000 & 2005.

Coastal Tourism (2006)

	Expenditures ($Millions)
ESSIM	220
NS	367
Impact allocation factor	60%

Based on a weighted average by type of activity, with allocations derived from: census district data in the Statistics Canada, *Travel Survey of Residents of Canada*, 2007; and population data for coastal recreation and boating.

Ports (5-year avg. 2002-2006)

	Capital Expenditures ($Millions)
Port of Halifax	11.3
NS	11.3
Impact allocation factor	100%

Data are derived from the Halifax Port Authority, annual reports.

Small Craft Harbours (2006)

	Number of Harbour Sites
ESSIM	45
NS	187
Impact allocation factor	24%

Data are provided by DFO.

National Defence (5-year avg. 2002-2006)

	Capital Expenditures ($Millions)
DND	45.0
NS	45.0
Impact allocation factor	100%

Data are derived from expenditure information provided by DND.

Oil & Gas (5-year avg. 2002-2006)

	Capital Expenditures ($Millions)
ESSIM	95
NS	95
Impact allocation factor	**100%**

Data are derived from the Sable Project-Nova Scotia Benefit Reports

Ship & boat building (2006)

	# of companies
ESSIM	32
NS	63
Impact allocation factor	50%

Data are derived from the Industry Canada website and by contacting key associations and government departments.

Government Services (2006)

	% of spending
DND	25%
DFO	14%
Other federal	31%
Provincial	55%

The impact allocation factors represent estimates of each department's expenditures in the LOMA (with weighted averages for other federal and provincial). Where possible, departmental expenditure estimates are tied to the level of activity in the LOMA by the industry for which the department is responsible (eg, DFO and commercial fisheries). DND allocation is notional because no basis for allocation exists.

Universities and ENGOs (2006)

	Expenditures ($Million)
ESSIM	5.5
NS	22.1
Impact allocation factor	**25%**

No LOMA-specific data are available. The allocation factor is notional based on the location of institutions and ENGOs and the relative economic activity within ESSIM.

3. GOSLIM

Fishing (2006)

	Landed Values ($000)
GOSLIM	444,000
NS, NB, PEI, NL & QC	1,531,845
Impact allocation factor	29%

Estimates are derived from the DFO website including various quota reports that correspond to NAFO area 4RST.

Aquaculture (2006)

	Production Value ($000)
GOSLIM	39,000
NS, NB, PEI, NL & QC	421,400
Impact allocation factor	9%

Estimates are based on data provided by provincial departments and various statistical reports. Estimates include provincial totals for QC and PEI and breakdowns of NL, NB and NS.

Processing (2006)

	Production ($millions)
GOSLIM	938
NS, NB, PEI, NL & QC	3,235
Impact allocation factor	29%

Production value data are from Statistics Canada 301-0006 with the LOMA share based on landed values.

Freight (2005)

	Tonnes of Cargo (000s)
GOSLIM	61,000
NS, NB, PEI, NL & QC	257,472
Impact allocation factor	24%

Data is derived from the Statistics Canada, 2005 Shipping in Canada Report based on a selection of ports found in GOSLIM.

Ferry (2006)

	Passengers (000)
GOSLIM	6,000
NS, NB, PEI, NL & QC	7,700
Impact allocation factor	78%

Estimates are derived from the Canadian Ferry Operators Association 2006 Annual Report.

Cruise ship (2006)

	Expenditures ($Millions)
GOSLIM	35
NS, NB, PEI, NL & QC	57
Impact allocation factor	61%

Estimates are derived from port-specific data in BREA, *The Economic Contribution of the International Cruise Industry in Canada*, 2007.

Marine Recreational Fishing (2006)

	Expenditures ($Millions)
GOSLIM	65
NS, NB, PEI, NL & QC	116
Impact allocation factor	56%

Estimates are based on area-specific fishing data derived from the DFO Survey of Recreational Fishing, 2000 & 2005.

Coastal Tourism (2006)

	Expenditures ($Millions)
GOSLIM	722
NS, NB, PEI, NL & QC	1,417
Impact allocation factor	51%

Based on a weighted average by type of activity, with allocations derived from: census district data in the Statistics Canada, *Travel Survey of Residents of Canada*, 2007; and population data for coastal recreation and boating.

Ports (5-year avg. 2002-2006)

	Capital Expenditures ($Millions)
Major Ports in LOMA	5.5
NS, NB, PEI, NL & QC	51.6
Impact allocation factor	11%

Data are derived from annual reports of various port authorities in the LOMA.

Small Craft Harbours (2006)

	Capital Expenditures ($Millions)
GOSLIM	6.6
NS, NB, PEI, NL & QC	23.9
Impact allocation factor	28%

Data are provided by DFO.

Ship & boat building (2006)

	# of companies
GOSLIM	104

Data are based on the number of ship and boat builders in the LOMA obtained by contacting key associations and government departments.

Government Services (2006)

	% of spending
DND	0%
DFO	38%
Other federal	14%
Provincial	24%

The impact allocation factors represent estimates of each department's expenditures in the LOMA (with weighted averages for other federal and provincial). Where possible, departmental expenditure estimates are tied to the level of activity in the LOMA by the industry for which the department is responsible (eg, DFO and commercial fisheries). DND allocation is notional because no basis for allocation exists.

Universities and ENGOs (2006)

	Expenditures (SMillion)
GOSLIM	18.5
NS, NB, PEI, NL & QC	73.991
Impact allocation factor	**25%**

No LOMA-specific data are available. The allocation factor is notional based on the location of institutions and ENGOs and the limited economic activity within PNCIMA.

4. Beaufort Sea LOMA

Subsistence Fishing (late 1990s)

	Value (SMillions)
Beaufort Sea LOMA	3.4
NWT	3.4
Impact allocation factor	100%

Data are derived from the Marine-Related Economy of NWT and Nunavut report.

Freight (2005)

	Tonnes of Cargo (000s)
Beaufort Sea LOMA	24
NWT	36.9
Impact allocation factor	65%

Data is derived from the Statistics Canada, 2005 Shipping in Canada Report based on a selection of ports found in the LOMA.

Coastal Tourism (2006)

	Expenditures (SMillions)
Beaufort Sea LOMA	470
NWT	470
Impact allocation factor	100%

Estimates are based on the data derived from Statistics Canada, Travel Survey of Residents of Canada, 2006.

Government Services (2006)

Beaufort Sea LOMA **NWT**	
Impact allocation factor	**100%**

The overall impact allocation factor represents a weighted average of each department's expenditures in the LOMA. Departmental expenditure estimates are tied to the level of activity in the LOMA by the industry for which the department is responsible (eg, DFO and commercial fisheries).

5. PNCIMA

Fishing (2006)

	Landed Values ($000)
PNCIMA	217,300
BC	324,327
Impact allocation factor	67%

Estimates are based on DFO landings data and Marine Use Analysis of the Pacific North Coast Reports.

Aquaculture (2006)

	Production Value ($000)
PNCIMA	85,500
BC	427,466
Impact allocation factor	20%

Estimates are based on data derived from the Economic Contribution of the Ocean Sector in British Columbia, Marine Use Analysis of the Pacific North Coast report and data from the BC Ministry of Environment.

Processing (2006)

	Production ($millions)
PNCIMA	487,585
BC	727,739
Impact allocation factor	67%

Production value data are from Statistics Canada 301-0006 with the LOMA share based on landed values.

Freight (2005)

	Tonnes of Cargo (000s)
PNCIMA	6,950
BC	133,057
Impact allocation factor	5%

Data are derived from Statistics Canada, *Shipping in Canada 2005* based on ports found in PNCIMA.

Ferry (2006)

	Passengers (000)
PNCIMA	**1,900**
BC	30,000
Impact allocation factor	6%

Estimates are derived from the Canadian Ferry Operators Association 2006 Annual Report. It was based on a percentage of vessel capacity.

Cruise ship (2006)

	Expenditures ($Millions)
PNCIMA	4
BC	408
Impact allocation factor	1%

Estimates are derived from port-specific data in BREA, *The Economic Contribution of the International Cruise Industry in Canada*, 2007.

Marine Recreational Fishing (2006)

	Expenditures ($Millions)
PNCIMA	180
BC	662
Impact allocation factor	27%

Estimates are based on area-specific fishing data derived from the DFO *Survey of Recreational Fishing*, 2000 & 2005.

Coastal Tourism (2006)

	Expenditures ($Millions)
PNCIMA	50
BC	1,674
Impact allocation factor	3%

Based on a weighted average by type of activity, with allocations derived from: census district data in the Statistics Canada, *Travel Survey of Residents of Canada*, 2007; and population data for coastal recreation and boating.

Ports (5-year avg. 2002-2006)

	Expenditures ($Millions)
Prince Rupert	18.4
BC	43.5
Impact allocation factor	42%

Data provided by several Port Authorities including Prince Rupert, Vancouver, Nanaimo and Port Alberni.

Small Craft Harbours (5-year avg. 2002-2006)

	Expenditures ($Million)
PNCIMA	1.2
BC	3.4
Impact allocation factor	30%

Data are provided by DFO.

BC Ferries (5-year avg. 2002-2006)

	Passengers (000)
PNCIMA	1,900
BC	30,000
Impact allocation factor	**6%**

For the purpose of the impact allocation, this report uses passenger data as an indicator of the distribution of capital spending. Applying 6% to 5-yr avg. spending of $57.6 million results in about $3.4 million in the PNCIMA.

Ship & Boat building (2006)

	# of Companies
PNCIMA	0

Data are derived from the Industry Canada website and by contacting key associations and government departments. Based on the information gathered, no ship & boat building companies were found within the LOMA.

Government Services (2006)

	% of spending
DND	25%
DFO	67%
Other federal	20%
Provincial	16%

The impact allocation factors represent estimates of each department's expenditures in the LOMA (with weighted averages for other federal and provincial). Where possible, departmental expenditure estimates are tied to the level of activity in the LOMA by the industry for which the department is responsible (eg, DFO and commercial fisheries). DND allocation is notional because no basis for allocation exists.

Universities and ENGOs (2006)

	Expenditures ($Million)
PNCIMA	15.5
BC	77.8
Impact allocation factor	**20%**

No LOMA-specific data are available. The allocation factor is notional based on the location of institutions and ENGOs and the limited economic activity within PNCIMA.

Table A2-1: Allocation factors for LOMA spending by federal and provincial departments

	PB/GB			ESSIM			GOSLIM			PNCIMA		
	Total expenditure in province	LOMA allocation factor (%)	LOMA expenditure	Total expenditure in province	LOMA allocation factor (%)	LOMA expenditure	Total expenditure in region	LOMA allocation factor (%)	LOMA expenditure	Total expenditure in province	LOMA allocation factor (%)	LOMA expenditure
Federal departments												
Department of National Defence (1)	55,400	0.75	41,550	863,800	0.50	431,900				550,225	0.25	137,556
Fisheries and Oceans Canada (2)	199,940	0.65	129,961	235,545	0.14	32,976	694,072	0.38	266,380	302,648	0.67	202,774
Other federal departments												
Transport Canada (3)	4,750	0.90	4,275	5,495	0.95	5,052	36700	0.10	3,670	13,100	0.10	1,310
Natural Resources Canada (4)	1,960	1.00	1,960	19,600	0.15	2,940	24000	0.04	960	2,000	0.00	0
Canada Food Inspection Agency (5)	1,940	0.65	1,261	2,545	0.14	356	9600	0.50	4,800	2,750	0.67	1,843
Environment Canada (6)	750	0.75	563	1,800	0.50	900	4,300	0.25	1,075	6,000	0.25	1,500
Weighted average other federal	9,400	**0.86**	8,059	29,440	**0.31**	9,248	74,600	**0.14**	10,505	23,850	**0.20**	4,653
Provincial departments/agency												
Fisheries and Aquaculture (7)	9,521	0.65	6,189	6107	0.14	855	30250	0.40	12,100	18,200	0.67	12,194
Tourism (8)	3643	0.68	2,477	7202	0.62	4,465	19270	0.50	9,635	16,420	0.10	1,642
Natural Resources/Energy (9)	3,758	1.00	3,758	8040	1.00	8,040	11800	0.00	0	12,760	0.41	5,232
Transportation (10)	12,135	0.05	607	7414	0.05	371	19560	0.05	978	108,400	0.05	5,420
Offshore Petroleum Board (11)	8,331	1.00	8,331	4875	1.00	4,875						
Weighted average provincial	37,388	**0.57**	21,362	33,638	**0.55**	18,606	80,880	**0.28**	22,713	155,780	**0.16**	24,488
Overall expenditures/allocation	302,128	0.67	200,931	1,162,423	0.42	492,731	849,552	0.35	299,598	1,032,503	0.36	369,471

Notes

1. DND unable to provide expenditure estimates by LOMA. Allocation is somewhat arbitrary, but linked to location of base within the LOMA and notional level of activity within the LOMA relative to overall coastline.
2. Allocation based on proportion of commercial landings from the LOMA for PBGB, ESSIM and PNCIMA; based on DFO Region spending for GOSLIM (Quebec, Gulf and 10% of Newfoundland).
3. Allocation based on proportion of cargo/ferry activity in the LOMA. A basis for weighting cargo vs. passenger output value is not available; given the nature of the activities, cargo activity is assumed to dominate.
4. Allocation based on departmental estimates of LOMA activity.
5. Allocation based on proportion of commercial landings from the LOMA.
6. EC unable to provide expenditure estimates by LOMA. Allocation is notional.
7. Allocation based on proportion of commercial landings from the LOMA.
8. Based on weighted average by type of activity, with allocations based on geographic distribution (census district) of survey data (tourist) and population distribution (resident).
9. All offshore activities are based within LOMAs.
10. Allocation captures only administraive costs associated with ferry transportation within the LOMAs. Ferry operating subsidies are reflected in ferry output revenues under marine transportation.
11. All offshore activities occur within PB/GB or ESSIM.

APPENDIX 3: ECONOMIC IMPACT MULTIPLIERS FOR MARINE-RELATED ACTIVITIES

Newfoundland and Labrador

Marine activity	GDP*			Employment**			Income*		
	Direct	Indirect	Induced	Direct	Indirect	Induced	Direct	Indirect	Induced
Fishing	0.43	0.12	0.12	4.66	1.95	1.39	0.29	0.06	0.09
Aquaculture	0.45	0.19	0.14	4.83	2.68	1.58	0.12	0.09	0.05
Fish processing	0.25	0.33	0.13	5.30	4.64	2.09	0.17	0.11	0.07
Oil & gas exploration/extraction	0.85	0.11	0.01	0.35	0.16	0.11	0.02	0.01	0.01
Support activities for oil & gas	0.46	0.19	0.14	4.00	2.42	1.35	0.19	0.07	0.06
Water transportation	0.35	0.13	0.11	7.00	2.60	2.02	0.30	0.06	0.09
Support activities for transportation	0.55	0.10	0.14	11.50	2.72	2.99	0.41	0.06	0.12
Tourism & recreation	0.40	0.30	0.15	11.00	6.00	3.57	0.28	0.22	0.13
Oil & gas facilities construction	0.45	0.10	0.12	3.50	1.77	1.11	0.25	0.06	0.08
Ports and harbours construction	0.40	0.20	0.13	6.00	2.00	1.68	0.26	0.07	0.08
Shipbuilding	0.47	0.08	0.12	11.65	1.37	2.73	0.34	0.03	0.09
Boat building	0.41	0.08	0.11	12.50	1.44	2.93	0.42	0.03	0.11
National Defence	0.45	0.35	0.18	5.45	2.50	1.67	0.45	0.07	0.13
Fisheries & Oceans	0.48	0.27	0.17	7.10	0.91	1.68	0.48	0.07	0.14
Other federal departments	0.66	0.12	0.17	6.82	2.22	1.90	0.66	0.07	0.18
Provincial departments	0.70	0.13	0.18	6.14	2.90	1.90	0.7	0.15	0.21
Universities	0.70	0.13	0.18	9.50	2.28	2.47	0.55	0.06	0.15
ENGOs	0.65	0.06	0.16	10.00	3.54	3.26	0.40	0.10	0.13

*Impact per $1 of industry output. **Impact per $1 million of industry output.

Source: Statistics Canada.

Nova Scotia

Marine activity	GDP			Employment			Income		
	Direct	Indirect	Induced	Direct	Indirect	Induced	Direct	Indirect	Induced
Fishing	0.52	0.12	0.17	7.18	2.05	2.31	0.37	0.06	0.12
Aquaculture	0.43	0.20	0.16	7.22	2.01	2.31	0.21	0.10	0.09
Fish processing	0.24	0.29	0.14	7.89	4.61	3.13	0.18	0.13	0.09
Oil & gas exploration/extraction	0.85	0.06	0.03	0.55	1.38	0.48	0.04	0.05	0.03
Support activities for oil & gas	0.46	0.37	0.20	6.30	3.12	2.36	0.32	0.11	0.12
Water transportation	0.41	0.10	0.13	5.70	1.32	1.76	0.33	0.06	0.11
Support activities for transportation	0.54	0.20	0.19	13.27	1.75	3.76	0.47	0.07	0.15
Tourism & recreation	0.42	0.25	0.17	12.00	7.00	4.75	0.30	0.25	0.15
Oil & gas facilities construction	0.50	0.30	0.21	3.50	1.75	1.31	0.24	0.06	0.08
Ports and harbours construction	0.40	0.20	0.16	6.00	9.00	3.75	0.26	0.32	0.16
Shipbuilding	0.50	0.12	0.16	8.04	2.01	2.51	0.32	0.07	0.11
Boat building	0.40	0.16	0.15	9.00	2.81	2.95	0.22	0.06	0.08
National Defence	0.71	0.14	0.22	12.28	2.92	3.80	0.71	0.11	0.23
Fisheries & Oceans	0.50	0.28	0.20	7.60	1.23	2.21	0.50	0.07	0.16
Other federal departments	0.70	0.15	0.22	6.20	3.10	2.33	0.70	0.09	0.22
Provincial departments	0.70	0.15	0.22	5.54	6.76	3.08	0.70	0.18	0.25
Universities	0.71	0.12	0.22	9.72	2.70	3.11	0.55	0.07	0.17
ENGOs	0.77	0.11	0.23	17.27	1.75	4.76	0.67	0.05	0.20

*Impact per $1 of industry output. **Impact per $1 million of industry output.
Source: Statistics Canada.

New Brunswick

Marine activity	GDP			Employment			Income		
	Direct	Indirect	Induced	Direct	Indirect	Induced	Direct	Indirect	Induced
Fishing	0.69	0.09	0.18	10.44	1.30	3.05	0.44	0.04	0.13
Aquaculture	0.31	0.16	0.11	4.62	2.70	1.90	0.13	0.08	0.06
Fish processing	0.20	0.11	0.07	4.45	1.91	1.65	0.14	0.06	0.06
Oil & gas exploration/extraction									
Support activities for oil & gas									
Water transportation	0.40	0.10	0.12	4.00	2.54	1.70	0.20	0.13	0.09
Support activities for transportation	0.54	0.15	0.16	11.70	2.37	3.66	0.74	0.17	0.25
Tourism & recreation	0.40	0.20	0.14	13.00	9.00	5.72	0.33	0.32	0.18
Oil & gas facilities construction									
Ports and harbours construction	0.40	0.20	0.14	6.00	9.00	3.90	0.26	0.32	0.16
Shipbuilding	0.41	0.14	0.13	6.93	1.76	2.26	0.19	0.06	0.07
Boat building	0.41	0.09	0.12	10.00	1.07	2.88	0.61	0.03	0.18
National Defence									
Fisheries & Oceans	0.31	0.26	0.13	4.70	0.43	1.33	0.31	0.03	0.09
Other federal departments	0.70	0.14	0.19	7.65	2.47	2.63	0.7	0.07	0.22
Provincial departments	0.70	0.14	0.19	5.46	4.97	2.71	0.7	0.14	0.24
Universities	0.71	0.13	0.19	9.00	2.52	3.00	0.56	0.05	0.17
ENGOs	0.70	0.05	0.17	13.00	1.37	3.74	0.55	0.03	0.16

*Impact per $1 of industry output. **Impact per $1 million of industry output.
Source: Statistics Canada.

Prince Edward Island

Marine activity	GDP			Employment			Income		
	Direct	Indirect	Induced	Direct	Indirect	Induced	Direct	Indirect	Induced
Fishing	0.62	0.07	0.14	6.26	1.38	2.06	0.45	0.05	0.13
Aquaculture	0.74	0.11	0.18	13.61	2.19	4.27	0.35	0.07	0.11
Fish processing	0.14	0.31	0.09	9.10	5.36	3.90	0.19	0.11	0.08
Oil & gas exploration/extraction									
Support activities for oil & gas									
Water transportation	0.20	0.06	0.05	6.60	2.27	2.39	0.20	0.14	0.09
Support activities for transportation	0.46	0.13	0.12	6.00	2.66	2.34	0.15	0.07	0.06
Tourism & recreation	0.38	0.20	0.12	10.00	5.00	4.05	0.25	0.18	0.11
Oil & gas facilities construction									
Ports and harbours construction	0.40	0.20	0.13	7.00	7.00	3.78	0.31	0.25	0.14
Shipbuilding	0.41	0.06	0.10	2.70	0.73	0.93	0.09	0.02	0.03
Boat building	0.39	0.06	0.09	9.83	1.17	2.97	0.27	0.03	0.08
National Defence									
Fisheries & Oceans	0.31	0.26	0.12	4.70	0.43	1.39	0.31	0.07	0.10
Other federal departments	0.70	0.13	0.17	8.92	2.36	3.05	0.51	0.05	0.14
Provincial departments	0.70	0.13	0.17	6.76	4.86	3.14	0.33	0.12	0.11
Universities	0.74	0.14	0.18	14.00	2.56	4.47	0.59	0.05	0.16
ENGOs	0.85	0.14	0.21	22.00	2.03	6.49	0.80	0.10	0.23

*Impact per $1 of industry output. **Impact per $1 million of industry output.
Source: Statistics Canada.

Québec

Marine activity	GDP			Employment			Income		
	Direct	Indirect	Induced	Direct	Indirect	Induced	Direct	Indirect	Induced
Fishing	0.60	0.13	0.25	5.85	1.95	2.89	0.38	0.08	0.17
Aquaculture	0.60	0.18	0.27	5.92	2.53	3.13	0.17	0.08	0.09
Fish processing	0.20	0.23	0.15	3.50	1.77	1.95	0.14	0.06	0.07
Oil & gas exploration/extraction									
Support activities for oil & gas									
Water transportation	0.45	0.17	0.21	6.00	2.81	3.26	0.34	0.12	0.17
Support activities for transportation	0.52	0.35	0.30	7.60	4.03	4.30	0.32	0.13	0.17
Tourism & recreation	0.51	0.35	0.29	12.00	8.00	7.40	0.32	0.29	0.23
Oil & gas facilities construction									
Ports and harbours construction	0.40	0.20	0.20	6.00	4.00	3.70	0.26	0.14	0.15
Shipbuilding	0.40	0.14	0.18	15.00	6.74	8.04	0.70	0.23	0.34
Boat building	0.38	0.19	0.19	6.76	2.61	3.47	0.25	0.09	0.13
National Defence	0.88	0.12	0.34	14.20	1.50	5.81	0.88	0.08	0.36
Fisheries & Oceans	0.44	0.12	0.19	6.50	1.14	2.83	0.44	0.06	0.19
Other federal departments	0.41	0.12	0.18	6.88	4.95	4.38	0.41	0.12	0.20
Provincial departments	0.30	0.13	0.15	6.81	5.00	4.37	0.3	0.13	0.16
Universities	0.75	0.14	0.30	9.40	2.26	4.31	0.56	0.07	0.23
ENGOs	0.74	0.13	0.30	16.04	2.00	6.67	0.62	0.07	0.24

*Impact per $1 of industry output. **Impact per $1 million of industry output.

Source: Statistics Canada.

British Columbia

Marine activity	GDP			Employment			Income		
	Direct	Indirect	Induced	Direct	Indirect	Induced	Direct	Indirect	Induced
Fishing	0.45	0.16	0.21	1.39	2.10	1.08	0.26	0.10	0.13
Aquaculture	0.27	0.30	0.19	3.97	4.16	2.52	0.12	0.15	0.09
Fish processing	0.30	0.20	0.17	6.12	2.24	2.59	0.17	0.09	0.09
Oil & gas exploration/extraction									
Support activities for oil & gas									
Water transportation	0.45	0.20	0.22	5.00	2.49	2.32	0.30	0.11	0.14
Support activities for transportation	0.52	0.16	0.23	6.96	3.62	3.28	0.32	0.12	0.15
Tourism & recreation	0.43	0.30	0.25	10.00	5.00	4.65	0.35	0.18	0.19
Oil & gas facilities construction									
Ports and harbours construction	0.40	0.30	0.24	6.00	5.00	3.41	0.26	0.18	0.15
Shipbuilding	0.47	0.16	0.21	6.21	2.18	2.60	0.33	0.09	0.15
Boat building	0.41	0.15	0.19	4.39	2.04	1.99	0.16	0.08	0.08
National Defence	0.82	0.10	0.31	13.95	1.80	4.88	0.82	0.06	0.31
Fisheries & Oceans	0.47	0.29	0.26	7.16	1.35	2.64	0.47	0.07	0.19
Other federal departments	0.65	0.18	0.28	7.00	3.08	3.12	0.65	0.10	0.26
Provincial departments	0.70	0.15	0.29	3.51	8.44	3.70	0.7	0.26	0.34
Universities	0.74	0.15	0.30	11.43	1.79	4.10	0.58	0.05	0.22
ENGOs	0.77	0.10	0.30	13.89	1.49	4.77	0.67	0.05	0.25

*Impact per $1 of industry output. **Impact per $1 million of industry output.
Source: Statistics Canada.